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FUNCTIONS OF OFFICERS OF THE MEDICAL DEPARTMENT

TITLE ONE OF MILITARY-MEDICAL OPERATIONS COURSES

PREPARED BY

BUREAU OF MEDICINE AND SURGERY

BUREAU OF NAVAL PERSONNEL

NAVPERS 10846

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PREFACE

It is the purpose of this course to present to the personnel of the Medical Department of the U. S. Navy the many problems involved in the care of the sick and injured, ashore and afloat, in peace and in war.

Section I presents a general discussion of the functions of the Medical Corps officers ashore and afloat. Sections II, III and IV follow a like discussion of the Dental Corps, Medical Service Corps, and the Nurse Corps.

The mission of the medical department is to maintain the health of the Navy and to care for the sick and injured. To fulfill this mission successfully a high standard of professional and technical skills, and a high degree of moral responsibility are required of the personnel of the Medical Department. In this connection, the code of Hippocrates, written some 2,400 years ago, is still significant and timely:

"I swear by Apollo, the physician, and Aesculapius, and Hygeia, and Panacea, and all the gods and all the goddesses—and I make them my judges—that this, mine oath, and this, mine written engagement, I will fulfill as far as power and discernment shall be mine.

"Him who taught me this art I will esteem even as I do my parents; he shall partake of my livelihood, and, if in want, shall share my goods. I will regard his issue as my brothers and will teach them this art without fee or written engagement if they shall wish to learn it.

"I will give instruction by precept, by discourse, and in all other ways to my own sons, to those of him who taught me, to disciples bound by written engagements and sworn according to medical law, and to no other person. So far as power and discernment shall be mine, I will carry out regimen for the sick and will keep them from harm and wrong. To none will I give a deadly drug, even if solicited, nor offer counsel to such an end; likewise, to no women will I give a destructive suppository; but guiltless and hallowed will I keep my life and mine art. I will cut no one whatever for the stone, but will give way to those who work at this practice.

"Into whatsoever houses I shall enter I shall go for the benefit of the sick, holding aloof from all voluntary wrong and corruption. Whatsoever in my practice or not in my practice I shall see or hear amid the lives of men which ought not be noised abroad—as to this I will keep silence, holding such things unfitting to be spoken.

"And now if I shall fulfill this oath and break it not, may the fruits of life and art be mine, may I be honored of all men for all time; the opposite if I shall transgress or be forsworn."

This book has been prepared by the Medical Section of the Naval Reserve Training Publications Project of the Bureau of Naval Personnel, with the cooperation of the Bureau of Medicine and Surgery.

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Section I

FUNCTIONS OF MEDICAL OFFICERS

CHAPTER 1

DETAIL DUTIES ABOARD SHIP

A man-of-war is an extremely compact floating structure containing instruments and offensive weapons of great precision, operated by officers and men who themselves must be highly trained, well directed, and in such physical condition as to be able to withstand the rigors of both the sea and battle. The smaller the ship, the more essential is the physical well being of each individual to the designed function of the ship.

As distinguished from the practice of medicine in a civilian community, the medical officer of a man-of-war must take the responsibility and initiative of seeking and providing the means and the will, to insure the good physical condition of the officers and men serving on his ship. This extends far beyond simply giving medical attention to the individuals who come to sick bay for medication.

It must be recognized that living conditions, toilet and bathing facilities, and meal service are, in comparison to normal conditions of civilian life, far from ideal, because of the very nature of shipboard life. In his role of sanitary and health representative of the commanding officer, the medical officer should gauge his recommendations for improvement, or his reports of unsatisfactory conditions, with proper consideration of the man-of-war's existing exigencies. In making such a report or recommendation to the commanding officer, the medical officer will be serving the ship's best interests if he has some practical course to offer to bring about desired improvements. In other words, he should not consider that his job is just to point out defects, but rather to offer a constructive plan for maintaining the ship and its complement at a high state of readiness for the service for which it is intended.

Medical departments aboard ship vary in size and organizational setup according to the ship's size, class, and mission. The fleet's hospital ship will, for instance, have a fully staffed and completely equipped naval hospital with considerable administrative organization and detail. A small ship, with two or three hundred men aboard might, in contrast, have only one medical officer, and one or two hospital corpsmen, with a minimum amount of administrative organization. The duties of the medical officer on a small ship, basically, are the same as those performed by the medical officer on a larger component of the fleet.

The working day begins with morning sick call which should be expedited within the limits of safety, in order that as many as possible may be returned to their divisions prior to muster for quarters. Minor ailments and repeat dressings may be seen, and their treatment outlined to be carried out by a corpsman. Thus a great percentage of what appears to be a large sick call may be handled in a relatively short time. Cases seen for the first time, or those not progressing properly, will require more careful inspection and study, hence will take up more time. Ear, nose, and throat cases require close scrutiny, as it is here one can hope to limit the spread of the common cold, and perhaps to observe early signs of acute contagious diseases. For this reason all drafts of new men reporting aboard are to be routed to the sick bay by the officer of the deck and examined for venereal or contagious diseases.

Following completion of sick call a careful inspection of the ward and other sick bay spaces is made. Any special work for the corpsmen is outlined, and the medical officer may proceed to the sanitary inspection of the ship. It is well to do this in a deliberate manner, observing not only sanitation, but any hazards which might lead to injury of personnel. The general welfare of the men may be bettered by the efforts of an interested medical officer who

is observant. He can give helpful suggestions to the executive officer on improved living conditions. Minor insanitary conditions existing can usually be remedied in the department involved by cooperation with those responsible. Where resistance is encountered, and in the more flagrant breaking of rules, report is at once made to the executive officer, and with his cooperation the situation is remedied. It should be kept in mind that the executive officer is responsible to the captain for all the detailed upkeep of the ship and any minor details that can be remedied by department heads relieves him to that extent.

Morning reports for the medical department on board ship can only be completed after sick call. They constitute a written report and summary of the health of the ship to the captain and all department heads. Promptness in submitting the morning report of sick, binnacle list, and muster report is expected. Careful checking by the medical officer of these reports obviates embarrassment later due to incorrect impressions conveyed by errors.

Physical examinations are frequent, consisting of those for promotion, reenlistment, confinement, and study of cases. So far as possible these should be worked in with regular routine, but when they are to be handled in large groups they must be planned or scheduled. In wartime all these extras require careful planning, both from the standpoint of medical officer and examinee, to avoid conflict with important war watches.

Instruction of hospital corpsmen must be a continuous activity and in general is best given in the afternoon. Instruction schedules made out on a weekly or monthly basis are practical, and allow men to prepare in advance of the instruction period. These periods can be made interesting by delegating part of the instruction to senior corpsmen who, through special training or long practice are able to present a subject properly. Effort should be made to relieve all men from duty who can be spared for this period, providing only a skeleton crew for the hour or two required.

First-aid instruction for the crew is best organized by divisions and in many cases can be arranged as part of the general instruction period held by division officers. In wartime it is sometimes necessary to give instructions to groups while they are on watch at the guns or on other stations. This should be done with the help of well-trained corpsmen, in order that all members of the crew receive the fundamentals of first aid soon after joining the ship, and will thus be prepared for action. In combat zones it is found that all personnel soon become first-aid conscious and will cooperate in every way with the Medical Department in its attempt to disseminate knowledge along those lines. Thought and application to this instruction are necessary in order that it may apply to one's particular ship and to one's particular problems as they arise. Experience shows that oftentimes lives are saved by the first persons reaching the wounded, hence the imperativeness of first-aid instruction to all hands.

Daily physical exercise, such as setting-up exercises for the crew, requires much consideration. It is difficult under war conditions to have any large percentage of the crew present at a stated time daily for such drills. However, it has been found practical and beneficial to divide the ship's company, by divisions or departments, into three or four sections and rotate these sections. In this manner all men are given some exercise in the fresh air twice weekly, and are further urged to spend some time on deck each day.

Battle organization, dressing station equipment, first-aid boxes, etc., are described in another chapter.

Maintenance of property and property returns are duties to be delegated to the chief hospitalman or the senior hospital corpsman. It is necessary for the medical officer to devote considerable time to this detail in order to indoctrinate an assistant in the proper estimation of the needs of the department, storeroom upkeep, and issue of supplies.

Careful checking of health records is necessary and should be done against the ship's muster roll to insure that all records are on board. To check them carefully on arrival for inoculations and vaccinations is a practical method of keeping them up to date. Missing records should be requested from the last station at once, and all health records should be forwarded promptly upon detachment of per-

sonnel. Identification tags are to be made for all who do not already have them, and notation made in the health record.

Care of the dead is a responsibility of the medical officer. Embalming, preparation of certificate of death (form N), and proper handling thereafter is carefully outlined in the *Manual of the Medical Department.* In wartime some variations from the standard practices, such as burial at sea, are authorized and are outlined in Bureau letters and instructions. Divisional officer duties are to be the responsibility of the junior medical officer; depending on the number of officers in the department this detail should be rotated and at all time supervised by the senior medical officer.

Essential Medical Department reports are enumerated in part and briefly discussed as follows:

Health record—all entries are to be made promptly and to be complete with signature of medical officer.

Hospital ticket (form G)—upon transfer of patients.

Morning report of sick—submitted daily.

Binnacle list—may be combined with morning report of sick.

Daily muster report—required on most ships by the executive officer, shows presence or absence of all Medical Department personnel.

Medical department journal—daily entries of all important activities in the department and signed by the medical officer on duty.

Treatment book—provides for entries of all patients treated, with their disposition.

Prescription files—to be kept up to date in the pharmacy, with separate files for narcotic and alcohol prescriptions.

Narcotic book—to be maintained at all time ready for inspection and checking with preparations on hand.

Alcohol book—entries to be made at time of expenditure.

Ward book—list of patients with orders listed for each; to be signed daily by the ward medical officer.

Laboratory book—showing all laboratory of the findings.
procedures under proper dates with a record

Venereal treatment book—listing all treatments and orders as given by the medical officer in charge.

Hull report—a weekly report to the first lieutenant's office regarding structural condition of medical department spaces.

Form F cards—to be made up on admission of a patient and completed at time of discharge.

Monthly form F—smooth form made up from the F cards, for purpose of compiling statistics.

Monthly report of venereal diseases and treatments given—includes record of any untoward reactions, which may serve to detect a faulty shipment of material.

Communicable disease report — submitted monthly.

Special reports—may be made to the Bureau and to the fleet surgeon at any time regarding unusual occurrences, and must be submitted in the presence of an epidemic.

Allotment reports (form B)—are submitted quarterly for financial purposes.

Surveys of Medical Department property—may be forwarded at any time.

Annual, other monthly and quarterly reports—to be tabulated in *Manual of the Medical Department.* A check-off list of these should be maintained in the record office to insure prompt and complete returns from the department.

Procedures outlined in this chapter may be applied to all types of Navy ships. On small ships the problems are proportionally less in number and smaller in size. The organization must always be built on the complement allowed, and should be enlarged as demands require. A less complex organization is more easily expanded and can be better supervised, and therefore is to be desired at all times.

CHAPTER 2

THE SICK BAY AND HOSPITAL SPACE AFLOAT

The planning and arrangement of hospital spaces in naval vessels will never remain static, being dependent on changes in ship design and variables in the methods of medical and surgical practice. A description of today's Medical Department aboard ship, therefore, probably will not be applicable for any great length of time.

The scope of the Medical Department facilities provided in a vessel is also dependent upon the complement of attached personnel and the mission of the ship. Thus, in a submarine, or a small surface ship, medical care is rendered by a hospitalman with a minimum of equipment and supplies; while the larger combat ship or transport, with medical officers, dental officers, hospital corps officers and men, and the superlative type of equipment and supplies now available, is in a position to render complete and definitive hospital care and treatment.

Hospital ships have been developed to the point where the Medical Department spaces provide facilities which are the full equivalent of a hospital ashore. Complete surgical, medical, ear, eye, nose, and throat, X-ray, laboratory, and dietetic facilities are included. The *sole* mission of these ships is the care of the sick and wounded, which permits them to operate under the terms of the Geneva Convention.

Certain vessels are designed or designated for the transport and care of large numbers of casualties as an incidental mission of these ships. They are not hospital ships but are classed as hospital transports; they are ships used for the evacuation of the sick and wounded to areas where full hospitalization is available.

In discussing the layout of hospital spaces aboard ship it will be obvious that each ship or class of ships presents an individual planning problem. It must be decided, on the basis of attached personnel, mission, and design of the ship, what should be provided and what may be accomplished in the arrangement of the hospital spaces. The Bureau of Medicine and Surgery has always maintained an active liaison with the design section of the Bureau of Ships. This has contributed greatly to bringing about many improvements in the arrangement and fixed equipment of the hospital spaces afloat. It is not always possible to have the most desirable location for sick bay and hospital spaces but by compromise and adjustments in design it is usually possible to provide at least suitable ones.

The number of bunks provided in the hospital spaces, as required under *General Specifications for Building Vessels of the U. S. Navy,* is fixed at 2 percent of the crew and 1 percent of troop berths. No specification exists for the lay-out or arrangement of hospital spaces, and plans must be developed to give the best possible functional result in meeting the requirements of each individual ship or class of ships.

The principal spaces and fixed equipment provided in a sick bay based on 30 sick berths are as follows:

SICK BERTHING SPACES

Sick ward.—Hinged berths are ordinarily arranged in tiers, two high, with a private locker for each berth. A suitable number of surgical beds is provided. Linen lockers, drinking fountains, and medicine cabinets are provided. Where possible a diet pantry and utility room are placed in spaces adjoining the ward. The ward head (toilet) should be adjacent and contains, in addition to toilets, showers, and lavatories, a sitz bath and soiled linen hamper. A bedpan and urinal rack or locker is also included in the head space if a utility room is not provided.

Quiet room.—At least one quiet room with private bath, toilet, and lavatory for seriously ill or for officer patients is desirable.

Isolation ward.—A separate space fitted with a suitable number of berths, with adjoining private head facilities, is provided for the treatment of communicable diseases.

Insane ward.—In certain vessels, depending on the ship's mission, a ward for insane persons is provided. The fittings in this space are so designed that escape and possibility of injury are prevented. When possible, separate head facilities and a space for a continuous watch are included.

Sanitary standards of sick bay berthing spaces.—In the sick bay berthing spaces the following are considered as minimum standards:

Toilets: One per 10 berths.
Urinals: One per 10 berths.
Showers: One per 20 berths.
Lavatories: One per 10 berths.

Dispensary.—This space, corresponding to the pharmacy ashore, is regularly provided on all but the smallest ships and may be combined with the laboratory or clerical office. It is equipped with a drug cabinet with standard racks for bottles above, sink, and distilling apparatus. A Dutch door is provided for dispensing.

Bacteriological laboratory.—If possible, it is desirable to provide a separate laboratory for esthetic as well as medical reasons. The equipment for this space should be a single built-in unit to meet all needs in carrying out laboratory procedures aboard ship.

Surgical dressing room.—If space is available, the surgical dressing room should be a separate compartment large enough to accommodate the facilities for carrying out the bulk of routine sick call, examinations, treatment, and minor surgical procedures. This will permit the proper reservation of the operating room for clean surgical cases. The space is equipped with a folding type operating table, and recently developed surgical lights with four mounting brackets so that desired lighting arrangements can be made. A built-in surgical cabinet is also provided for the improved stowage of supplies and equipment. Other equipment, such as therapy lamps, diathermy apparatus, office sterilizers, or treatment chair may be provided for this space as desired.

Operating room.—When sufficient space is available for both a surgical dressing room and operating room, the latter is used for the exclusive treatment of noninfected and major surgical cases. Attention is given to the details of construction in this space in order to provide materials, equipment, and functional arrangements which will insure proper surgical cleanliness and methods of operating. The deck should be of suitable nonabsorbent material which can be easily cleaned.

Electrical conductivity of the deck is usually not necessary to consider because explosive anesthetics are rarely used aboard ship. The operating room is not air-conditioned except under special circumstances where structural conditions make it necessary. The operating light consists of four surgical lights of 200 volts with 8 mounting brackets which permit various lighting arrangements. A built-in surgical supply cabinet is provided, preferably flush with the bulkhead in order to eliminate dust-catching surfaces. A major type operating table, dressing and instrument stands, and hinged washbowls are installed. Means are provided for securing all loose equipment in a seaway.

Sterilizing room.—When possible a separate space for sterilization is provided in order to avoid the dissemination of steam and wild heat from sterilizers into the operating room. The sterilizer equipment usually consists of a combination pressure dressing sterilizer (autoclave) either 16 by 24 inches or 20 by 36 inches, a boiling type sterilizer 16 by 6 by 4 inches or 20 by 10 by 9 inches, and a hot-and cold-water sterilizer (usually combined in one tank) of 8 or 15 gallons capacity. The combination sterilizer may be either steam or electrically heated and it is frequently necessary to provide odd combinations of these units to fit the space available. A hood is installed over the combination sterilizer to carry off excess vapor. If space permits, a dressing cabinet with work counter is included in the sterilizing room.

Scrub room.—When possible a separate scrub room or scrub alcove is provided to adjoin the operating room. It is equipped with a standard scrub sink, soap container, and, if space permits, a small clothes locker.

X-ray darkroom.—This room is used for film processing and for storage of the "suitcase"

type X-ray machine. A complete processing outfit, with cooling apparatus, work bench, and storage cabinets is provided.

Venereal treatment room.—This space is provided for venereal prophylaxis and treatment. Straddle stands, prophylactic locker and lavatory are installed.

Examining room (aviation).—A space is provided in aircraft carriers where the special examinations required for aviation personnel can be conducted. This space, if possible, should be 24 feet in length and fitted with such special equipment as the Bárány chair and a phorometer.

Doctor's office.—A doctor's office is provided for purposes of administration and private consultation. It may be equipped with desk, files, bookcases for medical reference books, and facilities for conducting limited physical examinations.

Clerical office.—This space is fitted with the necessary furniture and equipment for carrying on the clerical work for the Medical Department. If possible, the clerical office should be provided as a separate space, although it is frequently necessary to combine it with the doctor's office.

Utility room.—This space is included in large ships to provide proper servicing of sick bay utensils. A bedpan washer and sterilizer, utensil sterilizer, bedpan and urinal racks, soiled linen hamper, and cleaning-gear locker comprise the equipment furnished.

Medical storerooms.—It is important that adequate storeroom spaces be provided for medical supplies. There should be two or more such spaces located in as widely separated parts of the ship as possible in order to provide dispersion of materials. Available storeroom space is usually in the lower parts of the ship, so that it is desirable to have an issue storeroom located in the sick bay area. A ship carrying about 1,500 personnel should have a minimum of 2,500 cubic feet in the main medical storerooms, plus 500 cubic feet in the sick bay issue storeroom. All storeroom spaces are fitted with metal shelving and bins.

Medical storeroom, destroyers.—The medical storeroom of a destroyer, more properly called the sick bay, is the victim of the crying need for space in these ships. In wartime operations the destroyer is frequently called upon to receive casualties, and a medical officer is aboard each of these ships. Besides the standard equipment of drug cabinet, boiling type sterilizer, and prone examining table, there has now been added a portable surgical light and a pressure dressing sterilizer. A prophylaxis locker is provided in the crew's head.

Battle dressing stations.—Battle dressing station spaces are provided for the emergency treatment of casualties during and following an action. These spaces are set aside and equipped with emergency surgical facilities in dispersed positions within the ship. The principal fixed equipment comprises a water-storage tank, hot-water heater, lavatory, hinged shelves for dressings, sterilizer, and storage space for supplies. A portable surgical light operating from ship's current or battery is valuable.

With changes in ship design incident to damage control it has developed that auxiliary dressing stations are necessary to care properly for casualties. These are provided in suitable locations, accessible to the ship's battle stations, and are equipped with material similar to that furnished at the battle dressing stations.

CHAPTER 3

SANITARY INSPECTION OF THE SHIP

To maintain a ship in good sanitary condition requires routine inspections by a medical officer, supplemented by a sense of good housekeeping instilled into the minds of all hands. To accomplish this it is necessary for the executive officer, first lieutenant, and medical officer to cooperate in all matters pertaining to life aboard the ship.

Routinely it is the duty of the medical officer to inspect the galley, scullery, ship's service store, pantries, living and messing spaces, brig spaces, heads and wash rooms, and, of course, sick bay, daily.

In the galley the necessity for a close supervision is dependent upon the morale of the commissary department. All supply officers are well versed in the quality, storage, preparation, and handling of food; and will insist upon scrupulous cleanliness on the part of the galley personnel.

A copy of the week's menu for the general mess passes over the desk of the medical officer, usually on Friday or Saturday, for the following week. Here the medical officer has his opportunity to observe quantity, balance, and sufficiency of the ration. He should observe in this menu whether there are foods to be served which require special precautions, such as cold meat, salads, hash, and cold beans. All of these require precautions. Meats served on the second day after cooking are just as good as are the methods of refrigerating and handling, but no better. In a well-organized galley, meats for salads are cooked early the day of use; the same will apply to hash and the use of cold beans. Exceptions may be made in the interests of economy, but close supervision is required to prevent spoilage, and climatic conditions must be considered as a guide to procedure.

All meats used on board ship—except in emergencies—are Government inspected and are so marked. Due to the time interval involved, one must guard against relying entirely on this procedure, and all doubtful appearing meat noted in the galley should be referred to the medical officer for his inspection. Tinned meats are used more and more. Generally speaking they keep well, but tinned hams will at times show signs of softening and even liquefaction in some areas, which unfit them for use. Economy is necessary but dangers of contaminating an entire meal are not to be compared with the discarding of a few items of food in that meal.

All fresh foods, which are often obtained from local sources, must be inspected by some member of the Medical Department. This may oftentimes be the duty of an experienced corpsman who is instructed to notify the medical officer at any time there is a doubt regarding the quality of the supplies. Milk, ice cream, and seafoods require close watching, and a knowledge of the source of the supply is often helpful in determining their qualities. Local health regulations and reports are usually reliable as to the dairy products in a community, and should be used by the ship's medical officer for guidance.

Galley spaces are inspected for general cleanliness of material; all utensils and machines used in the preparation of food should be closely watched. Meat-slicing machines, if not properly cleaned, may be a source of food tainting or spoilage.

The butcher shop is usually a matter of pride to the commissary officer; it can be maintained in a neat, clean, and orderly fashion at almost all times. Meat blocks require careful scraping and cleaning, and are usually covered with a layer of clean salt to remove excessive moisture and to prevent development of odors.

The spud-peeling and vegetable room is difficult to maintain in a neat condition, but reasonable cleanliness must be maintained. Cold-stor-

age spaces must be inspected at weekly intervals, and at any other times as indicated by break-downs or doubtful food preservation. Here it is difficult to avoid moisture, but cleanliness in appearance and a minimum of odors can be maintained. Washing down with soda water will often remove undesirable food odors as well as cleanse.

Personnel inspection of all food handlers on the ship excepting the breakout men should be carried out weekly. This involves at times careful organization and cooperation with the commissary officer and master at arms, but can be arranged so that all men are present for inspection. Remember, the man who is too busy to appear for inspection may be the one who is harboring a venereal infection. Throat, skin, and venereal infections are to be looked for on these inspections.

The scullery is of particular interest to the medical officer as it may be the point at which the spread of disease is interrupted, or through inefficiency it may be the source of an epidemic of disease. It is directly under the first lieutenant, who more or less delegates its operation to the chief master at arms. Men assigned here for duty are taken from all departments of the ship and most often are men least experienced in life aboard ship. Their stay is often limited to 1 to 4 months; hence there is a constantly changing force.

Ships provided with a modern dish washing machine and sterilization tank can maintain a sanitary scullery. With the cafeteria system of feeding which prevails, there are fewer dishes to handle, thus reducing chances for individual contamination. Aluminum trays may be readily sterilized, carefully dried in air, and stored for the next meal with no handling by individuals. Thorough cleansing with hot water and soap powder in the washing machine prepares them for the sterilizing tank. Here they withstand a temperature of 212° F. or above for the 3- to 5-minute period without harm. A recording thermometer connected to the sterilization tank is an excellent safeguard and shows the temperature of the water in the tank during the hours of operation. It is strongly recommended for all sculleries.

Ship's service stores which manufacture and sell ice cream require close supervision. These stores are always under the supervision of a commissioned officer whose duty it is to maintain them in good working order. Sanitary conditions must be maintained and personnel working in the store must report for inspection with other food handlers. For ice cream manufacture, dry mix is used at sea. In port wet mix is often obtained from a local dairy and is frozen aboard. Dry mix is put up in sealed tins and keeps for long periods of time without deterioration. Wet mix must be carefully handled and of course kept in cold storage until used. In either case samples of the finished product should be submitted for laboratory examination at times to guard against all breaks in methods of preparation.

Pantries for the various officers' messes are inspected daily. Dependent upon the efficiency of the mess treasurers and the help provided them, they are kept in good or poor sanitary condition. Again with rapid expansion, men of less experience and training will be used, and it is incumbent on the Medical Department to be more than ever on the alert during inspections for cleanliness. Presence of food particles in cracks and crevices leads to the attraction of roaches which so often invade pantries. Constant attention to thorough cleaning after each meal, supplemented by occasional spraying with Navy insecticide does much to eliminate this evil.

Ice boxes should be inspected for cleanliness and for proper temperatures. Certain foods should be stored in separate compartments to avoid complaints regarding mixed flavors which are often interpreted as harmful contaminations. Butter will absorb flavors from other foods, rendering it unpalatable.

Small dish washing machines are desirable for pantries, but are not available on all ships. Hence constant indoctrination must be carried on to impress the stewards and mess boys with the importance of proper dish washing. Facilities for washing hands should be available either in or near all pantries. Mess boys should frequently wash their hands while working about pantries and serving food. This is doubly important in warm climates where they are handling ice for cold drinks in the wardroom. The question of proper handling of left-overs here is an important one as stewards attempt

all sorts of economies to maintain a reasonable mess assessment. The medical officer must be vigilant and at the same time as helpful as possible in solving these problems.

Responsibility for cleanliness in living spaces and messing compartments is primarily that of the division officer. He may at times need helpful suggestions from the medical officer and this should be freely given. Hammocks should be swung on a minimum of 3-feet-centers, and alternate men should sleep with heads in opposite directions. Bedding should be aired at not too long intervals, depending on weather conditions. While being aired—on upper decks usually—it should be inspected by the medical officer for cleanliness, state of repair, and infestation. A mattress showing bugs, or evidence of bugs having been present, should be traced to its bunk frame and a proper search made for bedbugs. This procedure at times may lead to the location of an entire compartment infested with bugs. Remedies to be used emphasize the sterilization of all infested mattresses if a large autoclave is available. If none is available the mattresses should be sprayed frequently during a period of one week. Spraying in the compartment, supplemented with the use of a blow torch on metal frame and springs will usually control the situation. Remember, this is a time when treatments often require repetition and perseverance on the part of your sanitary squad or corpsman. Carboxide gas is a deterrent, but cannot be looked upon as a sure remedy for bedbugs. Painting for the sealing of cracks is helpful. Any method used must be followed up closely and an attempt made to limit the spread of the infestation.

There is a marked tendency to overcrowd berthing and messing spaces over the designed capacity during wartime conditions. Ventilation has, of course, fallen below standard with the elimination of ports, and this must be compensated by artificial ventilation, which, is often a problem. During wartime with ships darkened at night necessitating the closing of ports (if present) and outside doors, forced ventilation by blowers must be used. Blower motors will only stand a stated speed for continuous operation, and do not attempt to have them operated over that speed. Sometimes by installing a portable blower or fans, a situation may be remedied or helped. Ships are constructed with a definite ventilating system which is difficult to alter on short notice. The minimum ventilation standard is 30 cubic feet per man per minute, plus an added volume to reduce heat. Where wild heat is present, as from adjoining machinery spaces, 40 cubic feet per man per minute is required.

Heating presents some problems, but is usually controllable by proper inspections and the taking of temperatures in various locations in the ship. The slogan here should be to under heat rather than over heat. Cooperation with a representative of the engineers' force should solve most of the heating problems.

Lighting requires some supervision, but again, it is built into the ship and if not the victim of too many changes and too much economy, is usually adequate for all purposes. Seats in the living compartments should be near proper light in case men wish to read.

Drinking fountains on modern ships are conveniently located and adequate. Their operation is dependent upon the engineers' force and are usually well maintained.

Brig spaces are to be livable but not luxurious. Adequate ventilation and light along with cleanliness is all that can be required in these spaces.

Heads or toilets should be inspected for cleanliness, proper flushing facilities, and the best ventilation obtainable. The flushing is accomplished in the crew's head by a constant flow of salt water in sufficient quantity to prevent stagnation. Any interference with this system should be at once reported and remedied. It is well to set aside one stall for venereal patients and have it so marked. This provides mental relief for the individual who fears contracting a venereal disease from a toilet.

Toilet and lavatory facilities should approximate the following:

Toilets: One per 20 men.

Urinals: One urinal or 1 foot of trough for each 25 men.

Showers: One per 25 men.

Lavatories: One lavatory for every 5 men.

Proper scrubbing of seats, which are removable, should prevent the spreading of crabs *(Pediculus pubis)*.

Urinals are prone to be odorous. Increased

flushing is about the only remedy, along with the deodorant cakes which merely serve to change the odor. The use of a solvent such as household ammonia to remove urinary salts is helpful.

Washrooms present little difficulty to the medical officer except to see that they are kept clean, and open sufficient hours per day for all men to keep clean. Whether showers are provided or not, it is found that most men use the washrooms and bathe daily.

Laundries are to be inspected for proper methods of operation, mainly to determine that sufficient hot water and soap are used to insure cleanliness. Laundry from contagious cases is to be treated in the sick bay prior to sending it to the general laundry. Either live steam, autoclave, or solution of cresol should be used for this purpose. Laundries are usually located in closed spaces, which fact associated with the steam and hot water used, produces very high temperatures. Personnel working here should be observed at intervals for general health, and where possible, additional exhaust ventilation provided to lower the temperature and humidity in the space.

Barber shops on the ship should be inspected for proper sanitary precautions. Post a list of precautions to be taken as to working on men with skin lesions, or men who are manifestly ill. Proper sterilizing facilities should be available and inspections repeated to see they are being properly used. All barbers are to be inspected at weekly intervals for cleanliness and personal health. Blood Kahns are to be taken before allowing new men to begin work, and checked as indicated after that time.

Inspection of sick bay spaces requires little comment. Here the character of the medical officer is reflected more than in any other part of the ship. It should be clean and orderly at all times, and maintained with a spirit of cheerfulness made possible only by proper selection of ward master and thorough indoctrination by the medical officer. Constant alertness for contagious diseases must be practiced and, when noted, proper methods of isolation instituted. Cubicle isolation has been found to be effective on ships affording no isolation ward, but must be strictly supervised.

Venereal inspections of the personnel are indicated at times, governed by the areas in which the ship is operating. Conditions in general are reflected in the local health departments, and these records should be consulted. Surprise inspections are time-consuming and if not properly organized may be very upsetting to the routine of the ship. Much can be accomplished by proper observation of all men reporting to sick call, as this group constitutes a good cross section of the personnel. If the medical officer has the confidence of his personnel, obtained through tact and a proper professional interest in their condition, concealment of venereal or any other diseases will be maintained at a minimum.

Instruction as to venereal disease prophylaxis must be repeated frequently. Printed instructions which may be read to divisions by division officers or hospital corpsmen when ships are entering port, are practical and cause little interference with ship's routine. This is best accomplished at a regular quarters-for-muster formation.

CHAPTER 4

VENTILATION AND AIR CONDITIONING ON BOARD SHIP

The medical officer is responsible for the maintenance of the health of personnel. Since air conditions constitute one of the most important factors affecting health aboard ship, the medical officer is called upon to define the proper air environment. Essentially on the basis of physiologic knowledge, he must be able to state the criteria that govern not only good air conditions but he must also be able to gage the limits of tolerance for unavoidable deleterious atmospheres.

In practice, the medical officer will seek *to maintain an ideal atmospheric state,* while the engineer is compelled by military considerations to provide only the minimal ventilation consistent with the welfare of personnel. A balance, therefore, must frequently be struck between divergent objectives.

The task, however, of the medical officer is clearly defined. It is to supply the engineer with quantitative data; to report on the environment in terms of temperature, moisture content, air movement, and radiant heat; to record physiologic data in terms of pulse rate, body temperature (mouth, envelope of skin, and the footshoe temperatures) and subjective reactions based on a fixed sensation scale.

THE PURPOSE OF VENTILATION, HEATING, AND COOLING

The air conditioning section of the Bureau of Ships has cognizance over matters of material pertaining to ventilation. The Bureau of Ships *Manual* states:

> The weight added, the space occupied, and the power consumed by the ventilation, heating, and cooling arrangements on a naval vessel must be at the expense of other military necessities. The minimum of equipment is provided which will accomplish the following purposes:
>
> 1. To maintain, the living spaces and normally occupied parts of the vessel, conditions which will keep personnel fit to fight under the strain of frequent watches during prolonged wartime cruising.
>
> 2. To maintain at battle stations and in working spaces conditions which will keep personnel physically fit to fight and mentally keen under the circumstances when such spaces must be occupied during war.
>
> 3. To maintain in certain spaces containing equipment or material, the conditions necessitated by the presence of that equipment or material.
>
> Basically the environment must be such that the body can maintain a proper heat balance, and the chemical composition of the air must be such that it contains no harmful components and provides a sufficient quantity of oxygen.

The factors to be considered in the air environment are temperature, humidity, air motion, odors, bacteria, the oxygen and carbon-dioxide contents, and harmful agents such as smoke and carbon monoxide.

It is the rapid shift, however, from one type of climatic environment to another that subjects personnel, unaided either by adequate clothing or by artificial heating or cooling, to severe hardships.

The structure of the warship further complicates the problem. To supply outside air to a craft catacombed with watertight compartments without weakening the flotation power of the ship provides the naval engineer with one of his most difficult problems. In addition the steel structure, for the most part deprived of insulation, is subject to high surface temperature not only from the sun's rays, but from heat emitted from machinery spaces.

Natural ventilation in the sense of utilizing open ports is therefore not feasible, since the modern ship presents a sealed hull 15 to 30 feet or more above the water line. The tremendous heat loads, moreover, emanating from machinery spaces must be removed primarily by a continuous supply of fresh air.

Blowers, both supply and exhaust, are required to pump air into and out of compartments, ducts to carry the air to the various compartments, and terminals of various types to distribute it to best advantage. In cold

weather heaters are needed, in warm weather bracket fans facilitate heat loss from the body.

At sea, outside air temperatures in naval operating areas are determined by the temperature of the sea water, 29° to 85° F., seldom exceeding a range of from 10° to 88° F.

Within the ship we are concerned with essentially two types of spaces. There is the *hot dry space,* in which the primary objective is removal of heat created by the operation of machinery. Temperatures of 110° to 120° F., dry bulb, and 80° to 84° F., wet bulb, may prevail in this type of space which is usually provided with facilities for spot-cooling. On the other hand, there is the *hot wet space,* a sealed or partially sealed space in which the removal of moisture from personnel is the essential problem. In such spaces the dry-bulb temperature may not exceed 90° to 95° F., but the wet-bulb temperature may be above 85° F., creating an atmosphere that is especially debilitating. In the hot dry space the factor of radiant heat means that both machinery and personnel require insulation.

The concept of effective temperature enables us to resolve the variable factors of temperature, humidity, and air motion into a single index to indicate the degree of warmth perceived by the body.

As a result of experiments made on a large number of human subjects it was found that the same subjective degree of warmth induced, for example, by an atmosphere saturated with moisture at 80° F. could be maintained at various combinations of wet-and-dry-bulb temperatures. Lines joining points on the psychrometric chart indicative of wet-and-dry-bulb temperatures imparting the similar sensations of warmth are called *effective temperature lines.*

The following air conditions, for example, each at 90° effective temperature, are considered to be equivalent in their warmth-giving properties: 90° dry bulb and 100 percent relative humidity; 105° dry bulb and 50 percent relative humidity; 120° dry bulb and 20 percent relative humidity; and 135° dry bulb in perfectly dry air or zero percent relative humidity.

For still air, that is an air velocity less than 30 cubic feet per minute, figure 1 shows the relationship between dry-bulb, wet-bulb, and effective temperatures.

Moving air lowers the effective temperature for a given temperature and humidity as indicated in figure 2.

For a saturated atmosphere and an effective temperature equal to skin temperature (95° F.), air movement gives no cooling. For this condition there is no heat loss by either convection or evaporation, either with or without air movement. For hotter conditions and the same moisture content, air velocity makes the individual feel hotter.

At lower temperatures the cooling effect of air motion increases progressively so that at 60° F. saturated air at a velocity of 100 feet per minute gives a sense of cooling equivalent to the lowering of the dry-bulb temperature by 3° F.

Comfort zones are given in the shaded areas in the effective temperature chart (figure 1) and are zones in which 50 percent or more of the people who were subjects in the tests expressed themselves as feeling comfortable. It will be noted that the zones extend from 70 to 30 percent relative humidity. It is recognized that extremely low humidities are not comfortable and that they may be conducive to respiratory infection in winter. Practical considerations, such as the prevalence of condensation on walls and windows, limit the humidity which may be used in cold weather to low percentages. Single glazed windows in a room at 70° F. air temperature with 30 percent relative humidity will condense water vapor when the outside temperature reaches a value of approximately 38° F.

Limitations of the effective temperature chart relate to conditions where radiation is not a factor. The experiments were made in rooms having no source of radiant heat, since the walls of the rooms were substantially at the dry-bulb air temperature. The winter condition in most rooms only roughly approximates this situation as there is often some radiation from heating units and usually some cold wall or window surfaces to which the bodies of the occupants radiate heat. The chart, therefore, must be interpreted as omitting the *fac-*

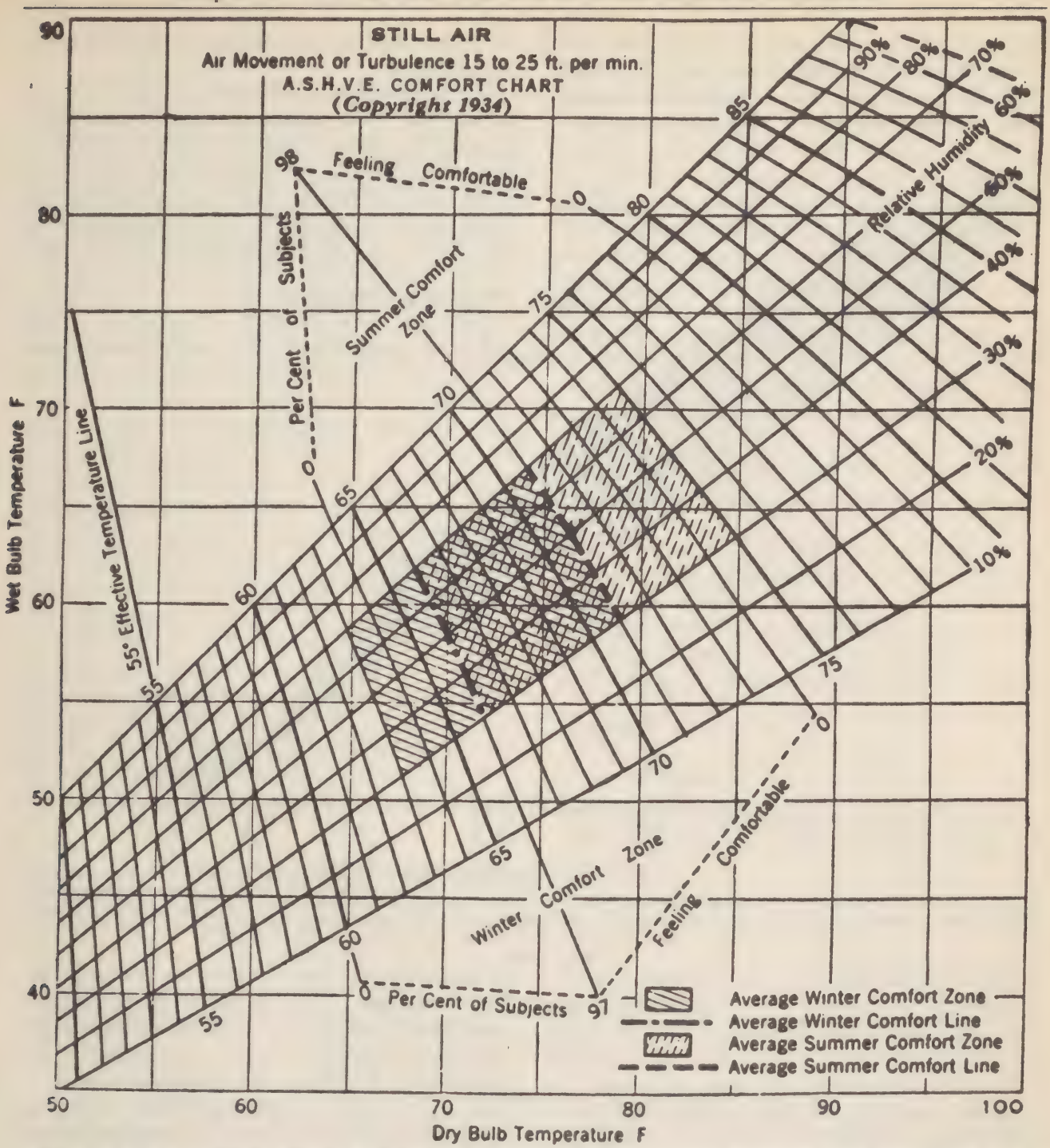


Figure 1.—A. S. H. V. E. comfort chart for air velocities of 15 to 25 F. P. M. (still air). Both summer and winter comfort zones apply to inhabitants of the United States only. Application of winter comfort line is further limited to rooms heated by central station systems of the convection type. The line does not apply to rooms heated by radiant methods. Application of summer comfort line is limited to homes, offices, and the like, where the occupants become fully adapted to the artificial air conditions. The line does not apply to theaters, department stores, and the like where the exposure is less than 3 hours.

tor of radiant heat which frequently is of great importance in the hot spaces aboard ship.

The upper limits of desirable air conditions are based upon shipboard test. Temperatures in the range of 77° to 83° dry-bulb with respective relative humidity values of 80 to 50 percent, will be associated with heat loss from the body without visible sweating. That is to

say, about 60 percent of the heat loss will be brought about by radiation and convection, and 20 to 40 percent by the evaporation of insensible perspiration.

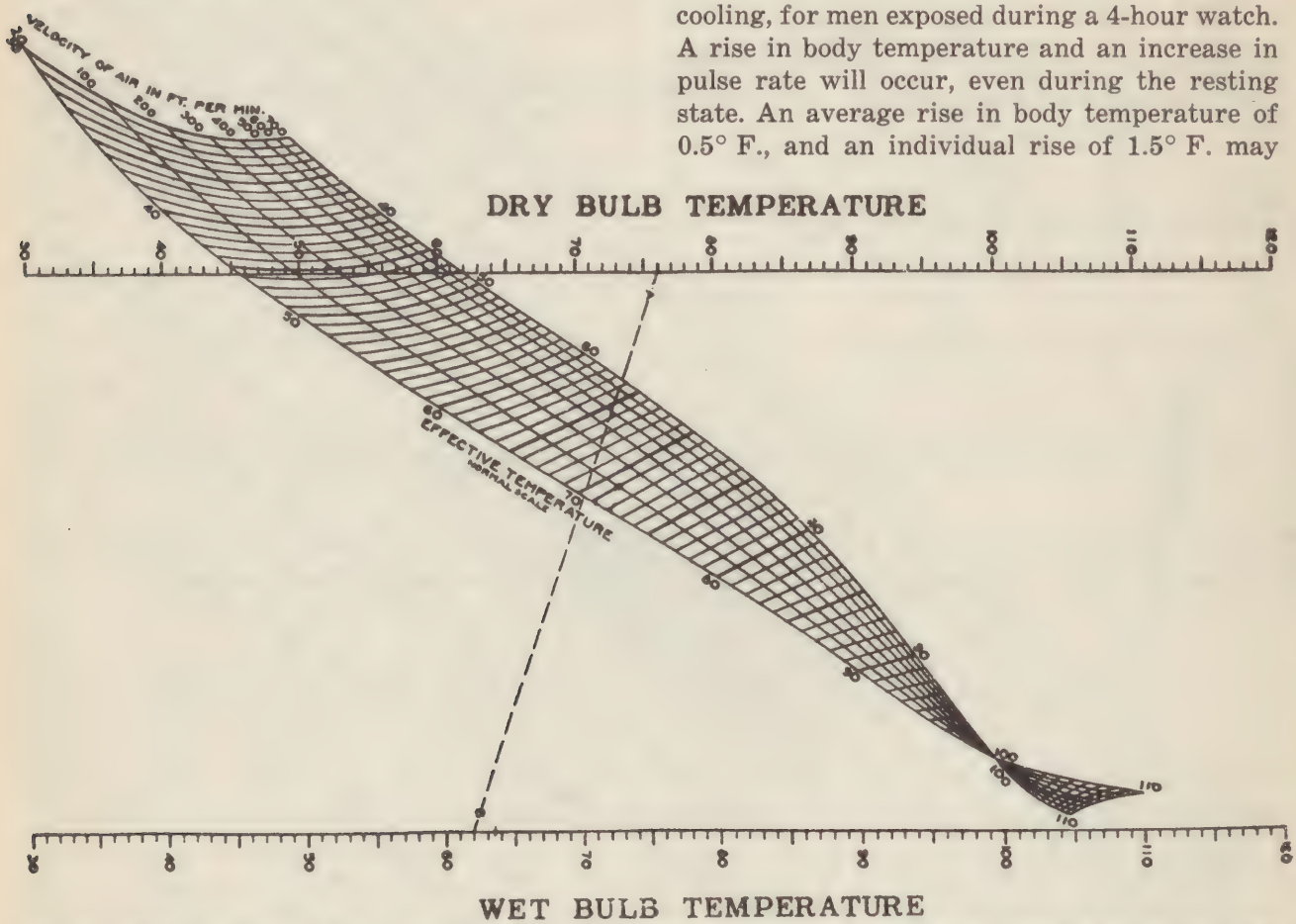


Figure 2.—Effective temperature chart showing normal scale of effective temperature. Applicable to inhabitants of the United States under following conditions: A. Clothing: customary indoor clothing. B. Activity: sedentary or light muscular work. C. Heating methods: convection type, i: e., warm air, direct steam or hot water radiators, plenum systems.

These values represent the upper limit of air conditions for comfort. Consideration, however, has been given to the fact that clothing can be removed, that bracket fans will increase air motion, that the men are acclimated to tropical weather, and that a fairly high dry-bulb temperature will prevent "cold shock."

In the Navy, air conditions conducive to comfort frequently do not prevail. Our problem often is to determine *what air environment can be tolerated.*

The upper limits of endurable air conditions may be fixed by various considerations:

1. An effective temperature of about 86° F. is the upper limit at which heat balance can be maintained at rest without a rise in body temperature.

2. An effective temperature of 91° F. is an upper limit in compartments deprived of spot-cooling, for men exposed during a 4-hour watch. A rise in body temperature and an increase in pulse rate will occur, even during the resting state. An average rise in body temperature of 0.5° F., and an individual rise of 1.5° F. may be arbitrarily assigned as values limiting further exposure. The corresponding limiting pulse-rate value is 140, a purely arbitrary figure but one that has proved to be useful in the prevention of collapse due to heat.

3. As a result of long experience in mining operations in South Africa, it is considered that 93° F. in air saturated with moisture, hence 93 effective temperature, is a critical level above which many cases of heat prostration occur.

Some tests indicate that the body temperature will reach 100.5° F. in 2 hours at 93 effective temperature, in 1 hour at 95 effective temperature, and in ½ hour at 99 effective temperature.

INFLUENCE OF ADVERSE AIR CONDITIONS

EFFECT OF HEAT.—The heat-regulating mechanism fails if the external temperature is so abnormally high that body heat cannot be eliminated as fast as it is produced. Part of it is retained in the body, causing a rise in skin and deep tissue temperature, an increase in the heart rate, and accelerated respiration. The metabolic rate increases also owing to the excessive rise in body temperature, and in extreme conditions a vicious cycle may result which eventually leads to serious physiologic damage. Example: heat stroke.

Acute overheating leads to four syndromes: *heat stroke, heat exhaustion, superdehydration, and heat cramps, figure 3.*

Heat stroke is usually preceded by cessation of sweating. There is fever and delirium, with full bounding pulse and elevated blood pressure, while the skin is flushed and dry. Immediately important in therapy is rapid heat removal by the best means at hand.

Heat exhaustion or circulatory insufficiency, on the other hand, is characterized by subnormal body temperature, cold, pale, clammy skin, low blood pressure and a state of circulatory shock. Here immediate treatment should be directed toward raising the body temperature to normal, improving the tone of the vascular system and allaying hyperactivity in the digestive musculature.

Of great importance is the physiologic consideration of the shift in blood from the internal organs to the periphery. The dilatation of the blood vessels of the skin and the abnormal distribution of blood to the skin area, merely for the purpose of cooling the body, place a heavy load on the cardiovascular system. This shift in blood, moreover, may explain the prevalence of gastro-intestinal disorders in hot weather.

A practical precept is that individuals in hot environments must be allowed to sit down periodically to relieve the excessive cardiovascular strain. Otherwise the common complaint and the factor that limits endurance is tired, swollen feet.

We are faced by a lack of knowledge as to why one individual develops the dynamic hyperpyrexia response and another the hypothermic shock reaction. *Unfortunately, one experience with either type of excessive heat reaction predisposes the patient to subsequent attacks*

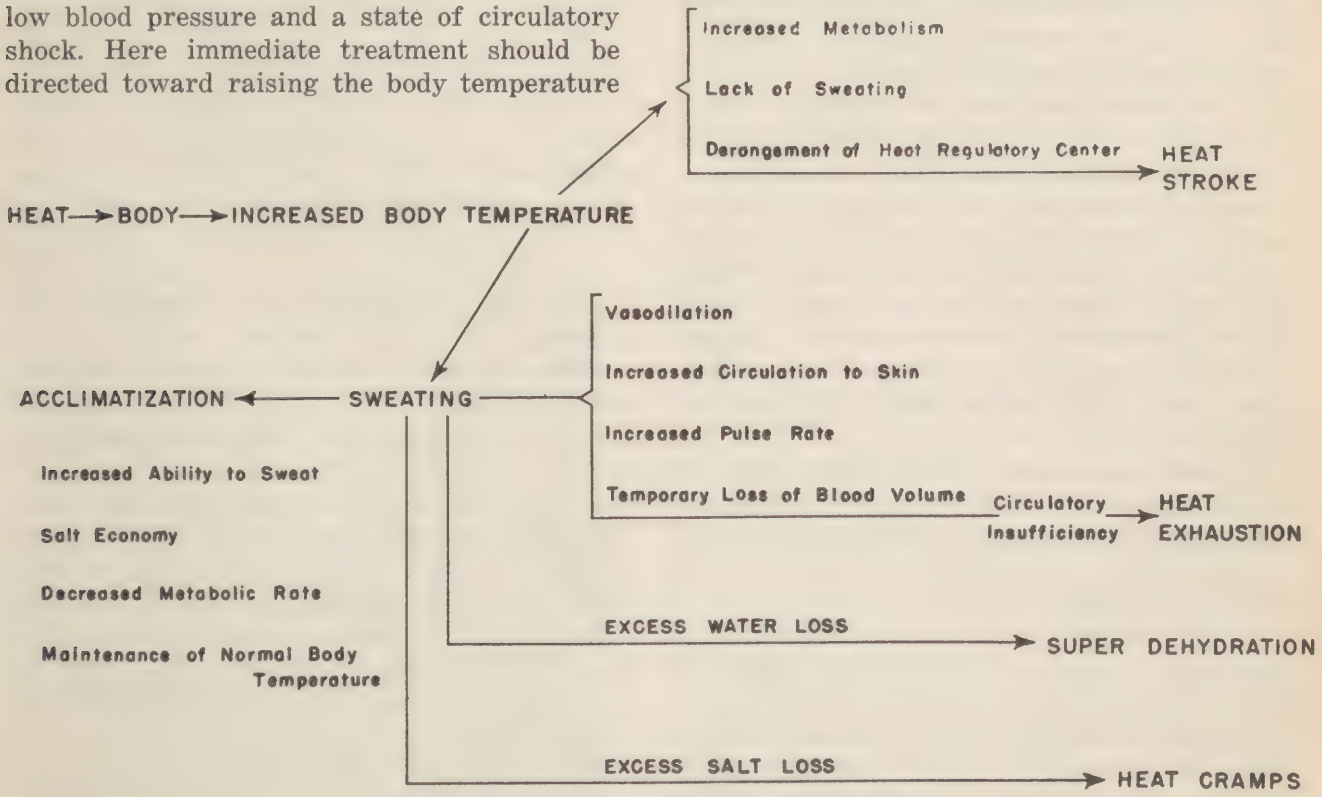


Figure 3.—Schema of syndromes induced by excess heat.

and to troublesome prodromal symptoms with exposure to external heat of relatively low order.

Superdehydration is an excessive loss of water as sweat without adequate replacement. The essential phenomena are thirst, reduced salivation, oliguria, acidemia, dyspnea, exhaustion, subnormal temperature, concentration of blood, shriveled skin, and sunken eyes.

Heat cramps in the skeletal muscles bear little relation either to heat stroke or heat exhaustion. The cramps are due primarily to excessive salt loss during profuse and prolonged perspiration without adequate salt intake. Relief is readily obtained by adding ordinary table salt to the drinking water, or taking it in any other convenient form. Sometimes a patient suffering from heat exhaustion will also be suffering from skeletal muscle cramps, but usually the conditions are not associated. Laborers in desert heat and in boiler or furnace rooms are particularly prone to heat cramps because of their excessive perspiration and rapid salt loss.

SALT, SALT SOLUTIONS, FLUIDS, AND VITAMIN C REQUIREMENTS.—Salt loss through the skin as a result of sweating is of the order of 0.1 to 0.5 percent depending upon the degree of acclimatization. During the period of 24 hours, 4 to 8 quarts of fluid and 4 to 8 grams of salt, equivalent to 1 to 2 teaspoons of salt may be lost in this manner.

Replenishment of this quantity of salt is best obtained, not through the ingestion of salt tablets, but by greater ingestion of salt at mealtime or by *adding salt to the drinking water to make a solution of not more than 0.15 percent salt.* The salinity of this solution is less than that of milk and in cold water it cannot be detected.

If small quantities of salt are not added to the drinking water, the serving of soup or tomato juice will take care of the problem, which is essentially the replacement of salt lost through the skin.

A bouillon cube containing 2 grams of salt, dissolved in a pint of water, twice daily, will usually meet the additional salt requirements.

Present studies have indicated that vitamin C is also excreted in sweat and the addition of vitamin C to the diet is accordingly desirable. Mills has stated further that additional vitamin B_1, thiamine hydrochloride, is beneficial in hot atmospheres.

AIR COOLING—NAVAL CONSIDERATIONS

Air cooling in living spaces sufficient to prevent men from sweating while at rest is a prime requirement. No single factor, with the exception of food, can be of more value in the maintenance of efficiency. Cooled air ensures the necessary rest for recuperation from strenuous daily activity, and makes for the diurnal change in atmosphere that is so conducive to efficiency and well being in temperate climates.

The experiences, in terms of continued efficiency and well being, at Hoover Dam, in the tropics, and in Washington, D. C., in the summer, are proof of the value of an atmosphere cooled sufficiently to prevent sweating of personnel in the resting state.

Overcooling of the air, on the other hand, should be avoided. The principle that must govern naval airconditioning is provision for the least amount of cooling required to prevent sweating. Usually not more than 10° F. difference in dry-bulb temperature should exist between the cooled and the untreated air.

If this is accomplished, men who may be sweating while at work will not be chilled when they are resting in the conditioned environment. Moreover, men leaving the conditioned compartment will be less likely to develop an idiosyncracy to heat when they are again subjected to the usual tropical air conditions.

Spot cooling is used in certain very hot spaces, such as engine rooms where it is impossible to provide sufficient outside air to maintain satisfactory temperatures throughout the spaces. Furthermore, too much air change in compartments containing steam propulsion equipment merely serves to cool down the equipment and thus waste heat and fuel, without appreciable improvement of the habitability. For such spaces spot cooling is provided. Near each watchstander's station a high velocity blast of outside air is introduced. Due to the high velocity, the incoming air does not at once diffuse and mix with the ambient air, so a spot of cooler air occurs in front of the blast terminal, into which the watchstander can occasionally step. This system is effective even at high outside temperatures so long as the

spot temperature is considerably lower than the ambient temperature.

EFFECTS OF COLD.—In the naval service we are concerned not only with the effects of cold air at both normal and abnormal pressures, but also with reactions following exposure in cold water.

In cold regions ashore men may be exposed to temperatures as low as —60° F. In aviation a 2° F. drop in temperature for every thousand feet up to altitudes of 30,000 feet gives rise to ambient temperatures between —50° and —60° F.

The effect of environmental temperature is intimately related to the character of the ambient medium. In diving operations, for example, conducted in cold water at a temperature of 40° F., body heat may be rapidly lost in the compressed atmosphere; on the other hand in rarefied still air at high altitude, temperature —20° F., aviators may not be too uncomfortable if they are protected from the effect of *radiant cooling*.

The general physiologic responses to cold are related to a fall in body temperature which may drop from the normal range of 97.3° to 99.1° F., to values of 92° F. in carbon monoxide poisoning and submersion, to 82° F. during cold treatments, and to values as low as 75° F. in severe alcoholism.

The initial responses to cold are indicative of stimulation of the sympathetic nervous system to produce shivering and a secretion of adrenin, which gives rise to constriction of blood vessels, increased heart rate and blood pressure, hyperglycemia, and increase in metabolism. There is also evidence that the thyroad gland enlarges in response to stimulation by cold. These reactions tend to be beneficial to the healthy individual but harmful to the unfit.

The harmful effects of chilling are manifest in individuals hypersensitive to cold, and in persons susceptible to respiratory infections. Some individuals, for example, exposed to cold water or air may exhibit urticaria and syncope, symptoms indicative of the liberation of abnormal amounts of histamine in the skin.

There is good evidence showing that exposure to cold and to changes in temperature lowers the resistance of animals to infection, apparently by depressing their defensive mechanism. The prevalence of respiratory diseases in cold weather is attributed partly to the lowered resistance of the mucous membranes of the nose and throat which results from the vasomotor shifts of blood in the internal organs.

The local effects of cold are first exhibited by a painful vasoconstriction and cyanosis followed by a reactive hyperemia, normal color, and cessation of pain.

The feet representing a dependent part of the body and possessing the poorest circulation, usually show the complications resulting from exposure to extreme cold and designated by such terms as *trench foot* and *immersion foot*.

In commenting on numerous cases of trench foot that occurred during the last war, Lake observed that death occurred in embryo hearts immersed in Ringer's solution at a temperature 21° F. or lower. Further experiments on the rabbit's ear and the human skin indicated that 21° F. was a critical temperature with reference to solidification and permanent damage to tissue.

In true frostbite, therefore, Lake believes that the tissues have reached a temperature of about 21° F. If this happens to the skin of the feet, as was the case with men standing in trenches with wet feet, then actual destruction of skin takes place which may lead to gangrene.

In the case of chilling without actual frostbite, for example, killing of tissues, the parts involved often become edematous on being warmed up. There can be no doubt that the easiest way to produce the edema of chilling consists in alternating cold and heat quite rapidly. *Therefore, heat should not be applied to an area of the body affected by cold.*

PROTECTION AGAINST COLD.—Since the normal range of body temperature is less than 2° F., and since acclimatization to cold does not permit an average lowering of effective temperature of more than 6°, it follows that the body must be protected by adequate clothing in cold environment, or the environment itself must be modified.

The tendency has been to overemphasize the second procedure to the neglect of the first.

Thus, heating of the air has often been excessive, producing a dry, hot atmosphere conducive to debilitation and to injury of the mem-

branous nasopharynx, especially when subsequent exposure takes place in cold air.

Emphasis must be placed, therefore, upon the protective value of clothing which serves to insulate the individual from cold. Electrically heated garments provide additional heat, if it is required. It is of interest that pioneer tests of electrically heated clothing were undertaken at the Experimental Diving Unit, Naval Gun Factory, Washington, D. C., in preparation for coldwater diving.

Not only is it possible to insulate the individual from cold in order to minimize body heat loss, but compartment bulkheads can be insulated to reduce the effect of *radiant cooling* and rapid heat transfer *through metal conductors.* An example of the value of bulkhead insulation is found in submarine compartments.

In aviation, especially, the insulation of the cabin interior is of great value when flights occur in air at a temperature of —56° F. The sealing of cabins, moreover, serves to eliminate loss of heat by convection. Thus the rarefied, *still air* acts as an insulator against rapid heat loss from the body.

In conclusion, it is emphasized that overheating of air is to be avoided in winter; overcooling of air must not be permitted in summer.

VITIATION OF AIR

1. OXYGEN DEFICIENCY IN CLOSED SPACES.—In unventilated spaces such as sealed compartments, and at high altitudes, oxygen deficiency and carbon dioxide excess are of major significance.

An incident, dramatic in its suddenness, occurred on the battleship *New York* some years ago. An officer and three men entered an upper blister compartment which had been closed for several months. The officer who was leading, started down the ladder to the lower compartment and suddenly fell to the bottom in collapse. Three men immediately descended to his assistance and were also overcome. Five additional unprotected persons attempted to reach the victims and were prostrated—nine in all. The officer and one man were dead when finally removed by a rescue group.

Another disaster was reported by the Cavite Navy Yard in the Philippines in 1931. Three civilian workmen entered a freshly painted submarine pontoon. All three were fatally overcome and three additional persons going to their assistance were removed in a state of collapse, but recovered. All of these cases were due to a lack of oxygen in the compartment.

Precautionary measures to be taken are:

a. Thorough ventilation of all spaces prior to entering.

b. *The adjustment of a life line to a person entering.*

c. Immediate availability of oxygen apparatus.

The fatal error repeatedly manifests itself of entering unoccupied compartments without taking the second and third simple, precautionary measures.

2. CARBON DIOXIDE ACCUMULATION is discussed under submarine ventilation.

3. CARBON MONOXIDE AND OTHER TOXIC GASES AND VAPORS.—In various industrial establishments and wherever internal-combustion engines, including automobile engines, gas heaters, or other heaters, operate under conditions of imperfect combustion, carbon monoxide is a serious menace; and in industry benzol and many other toxic fumes and gases may present grave problems.

A fundamental principle underlying the physiologic action of gases is illustrated by the time of exposure versus concentration rule for carbon monoxide.

TIME OF EXPOSURE V. CONCENTRATION RULE:

a. Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 3 (no perceptible effect).

b. Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 6 (just perceptible effect).

c. Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 9 (headache and nausea).

d. Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 15 (dangerous to life).

In the Hudson River tunnels, for example, a concentration of 4 parts of carbon monoxide per 10,000 is permissible for a truck passing through in 45 minutes. This means 4 multiplied by 0.75 or 3, a concentration devoid of annoyance to the driver.

SYMPTOMS IN RELATION TO CONCENTRATION OF CARBON MONOXIDE

Concentration	*Effect*
0.01 percent or 1 part in 10,000	No symptoms for 2 hours.
0.04 percent or 4 parts in 10,000	No symptoms for 1 hour.
0.06 to 0.07 percent or 6 to 7 parts in 10,000	Headache and unpleasant symptoms in 1 hour.
0.10 to 0.12 percent or 10 to 12 parts in 10,000	Dangerous after 1 hour.
0.35 percent or 35 parts in 10,000	Fatal in less than 1 hour.

4. BACTERIA.—The next type of foreign impurity which must be considered in connection with the atmosphere is the presence of living micro-organisms, particularly those of a pathogenic nature. .Wells demonstrated the important fact that while droplets of a certain size (over 0.1—0.2 mm. in diameter) settle rapidly to the floor, those below this critical value lose their water by evaporation before falling any considerable distance. He showed that bacteria from this source may actually persist in the atmosphere in considerable numbers for many hours. These results certainly indicate the possibility of air-borne infection, and recent accomplishments in the sterilization of the air in hospitals or sickrooms by ultraviolet radiation merit further study.

5. ODORS.—So far as the air of an ordinary occupied space is concerned, there remains one other factor to be considered, that of the unidentified substances associated with the odors produced by human bodies and by various organic substances. There is reasonably clear evidence of an influence of such odors upon appetite which is of real hygienic significance. This was demonstrated by the study of the New York Commission on Ventilation with respect to body odors.

Herrington and Winslow have shown that relatively slight odors of heated house dust (even when not consciously perceived by the subjects) had a very definite effect in reducing the appetite for food, an influence of distinct hygienic significance.

Yaglou has pointed out the value of using odor as an index of air quality. He found that the odor index as employed by trained observers was a better criterion of air supply per person in a space than the carbon dioxide concentration.

The practical application of this fact is of the greatest importance in the Navy. Thus, the adequacy of ventilation of any occupied compartment, particularly a berthing space, can be determined quickly by trained observers entering the space from another space having a much lower odor level.

METHOD OF CONDUCTING STUDIES ABOARD SHIP.—It is possible to employ small groups of naval personnel, comprising 8 or 10 men, for the purpose of making systematic observations which serve to define the climatic environment as accurately as do the psychrometric instruments. The men essentially become *comfort* meters to record certain simple but basic physiologic data.

Oral temperature is observed by placing the thermometer under the tongue for a period of 5 minutes and reading in place. Smoking, fluids, and food are prohibited for a period of 1 hour prior to the reading.

Envelope temperature is the temperature of the air layer between the skin and the undershirt at the level of the xyphoid process. It is a convenient index of skin temperature and usually is in close agreement with skin temperature for the corresponding area, as indicated by the following data applicable to engine-room workers in tropical waters:

Date	*Skin temperature*	*Envelope temperature*
May 16	96.3 F.	96.6F.
May 17	96.1	95.3
May 18	97.2	97.2
May 19	96.6	96.7

In practice, an 8-inch thermometer graduated to 0.2° F. is suspended from the neck so that the bulb rests over the xyphoid process of the manubrium. The bulb is shielded from clothing and skin by means of perforated X-ray film or plaster of paris. The distance of the bulb from the skin is maintained constant (figure 4).

The foot-shoe temperature is obtained by placing a thermometer in the shoe so that the bulb rests under the instep (figure 5).

The feet, representing a part of the body with less adequate circulation by reason of distance from the heart, and because of the retarding influence of gravity, should closely reflect ambient temperature changes.

Table 1.—DATA COLLECTED ON A WATCHSTANDER IN A HOT SPACE

Date and hour	Oral temperature	Envelope temperature	Foot-shoe temperature	Pulse Rate	Effective temperature (station)
May 29:					
1	99.3	98.5	101.0	144	95.5[1]
2	99.2	96.8	101.0	140	
3	98.6	95.5	101.2	108	
4	98.6	96.0	101.2	116	

[1] Collapse would have occurred in such environmental temperature without access to "spot-cooling."

It appears that this temperature is affected not only by the temperature of the foot reflecting, as it does, peripheral blood flow, but also by the temperature of the shoe itself which in turn is affected by the temperature of the ambient air and the deck on which the men stand.

Foot-shoe temperatures between 70° and 90° F. are consistent with comfort. Below 60° F.

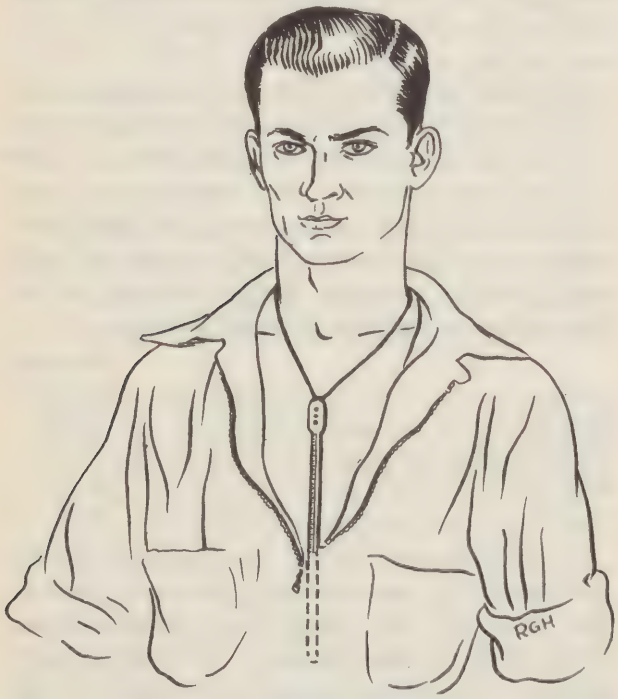


Figure 4.—Envelope temperature.

the feet are cold and above 100°.F. the feet are hot. Regardless of the air environment the foot-shoe temperature may be regarded as an index of comfort.

The pulse rate is the most easily determined and perhaps the most significant of all physiological observations. As previously emphasized, an increase in pulse rate usually shows a linear relationship to body temperature. As an indication of the effect of air conditions, it has proved to be extremely valuable.

In an environment compatible with efficient performance, the pulse rate in individuals



Figure 5.—Foot shoe temperature.

seated at rest falls over a period of several hours. In an adverse environment, the pulse rate either fails to decrease or it rises. The pulse rate level, moreover, is of considerable importance.

In trained subjects the increased pulse rate recorded under controlled conditions reflects increased peripheral blood flow essential for body cooling and for the maintenance of the ability to sweat.

The constancy of the average pulse rate recorded on submarine personnel is shown by the values in table No. 2. The range of average values recorded three times a day for a period of 10 days lay between 79 and 85. A rise in average pulse rate to 90 occurred during a break-down of the cooling system.

Table 2.—VARIATION IN BODY TEMPERATURES AND PULSE RATE

(Daily observations on 3 groups each consisting of 17 men on a submarine)

Date	Hour	Oral temperature	Envelope temperature	Foot temperature	
New England data:		°F.	°F.	°F.	
Aug. 21	1900	98.6	89.9	82	85
Aug. 22	1000	98.3	90.8	87.7	78
	1300	98.4	89.9	90	84
	1700	97.8	87.4	87.2	77
Average		98.2	89.4	88.3	80
Aug. 23	1030	98.4	86.8	84.6	78
Key West data:					
Sept. 11	1000	98.6	91.9	95.3	82
	1300	98.6	91.3	94.2	84
	1700	98.6	92.9	94.5	80
Average		98.6	92	94.7	82
Sept. 12	1000	98.6	90.2	94.2	84
	1300	98.8	92.2	94.7	83
	1700	98.8	93.8	95.5	86
Average		98.7	92.1	94.8	84
Sept. 13	1000	98.6	91.6	96.1	81
	1300	98.7	92.7	96.3	83
	1700	98.6	93.1	95.9	83
Average		98.6	92.5	96.1	82
Sept. 14	1000	98.6	92.8	96.1	82
	1300	98.6	92.8	96.1	82
	1700	98.8	93.1	95.5	83
Average		98.7	92.9	95.9	82
Sept. 15	1000	98.5	92.3	95.8	81
	1300	98.7	92	96.2	83
	1700	98.8	93.1	95.9	82
Average		98.7	92.5	96.0	82
Sept. 16	1000	98.6	92.2	96.3	85
	1300	98.8	91.9	95.8	85
	1700	98.7	92.9	95.7	83
Average		98.7	92.3	95.9	84
Key West data—Con.					
Sept. 17	1000	98.5	93.3	96	82
	1300	98.7	92.5	96.1	83
	1700	98.6	93.5	95.1	78
Average		98.7	93.1	95.7	81
Sept. 18	1000	98.5	92.6	95.8	79
	1300	98.5	92.6	96.1	83
	1700	98.9	92.8	95.7	83
Average		98.6	92.7	95.9	82
Sept. 19	1000	98.5	93	96.1	82
	1300	98.7	92.4	96.7	85
	1700	98.6	92.8	95.8	81
Average		98.6	92.7	96.2	83
Sept. 20	1000	98.5	93.1	96.8	80
	1300	98.8	93.6	97.1	90
Average		98.7	93.4	97.0	85

As an upper limit for pulse rate of men engaged in light activity in hot environments, an arbitrary value of 140 has been used. This limit permits a safety factor, since an increase in pulse rate to 170 or 180 frequently precedes collapse.

Weight and urine output should be determined by weighing the subject and collecting the urine in a measuring flask.

Condition of the skin should be recorded as dry, clammy, damp, wet, and running or dripping.

The mental state should be described as asleep, drowsy, awake, and alert.

Subjective response as to temperature is recorded on a fixed sensation scale, using the following terms: cold, comfortably cool, comfortable, comfortably warm, and hot.

Table 3.—AVERAGE VALUES 10 MEN OBSERVED DAILY IN A COMPARTMENT OF A WARSHIP

Date and hour	Schneider index (1)	Pulse rate sitting (2)	Temperature Oral (3)	Temperature Envelope (4)	Air Temperature Dry bulb (5)	Air Temperature Wet bulb (6)	Effective temperature (7)	Remarks
June 3:			°F.	°F.	°F.	°F.	°F.	
1	10.7	70	98.9	88.6.	78.5	69	74.5	Comfortably cool; Lima, Peru.
2	10.6	70	98.8	89.9.				
3	11.4	67	98.8	89.7.				
June 4:								
1	8.8	75	99.1	91.9	83	73	78	Comfortable or comfortably warm; awake. Sea temperature 68.
2	8.6	74	99.1	92.5.				
3	9.5	71	98.9	92.2.				
4	9.9	68	98.9	92.1.				
June 5:								
1	7.6	77	99.4	91.7.	83	73	78	5 men comfortable and awake; 3 men comfortable and alert; 2 men comfortably warm. Sea temperature 70.
2	8.6	72	99.1	91.6.				
3	9.5	69	98.9	92.1.				
4	9.9	66	98.8	91.3				
June 6:								
1	8.1	74	99.2		87	80	83	Out of Humboldt current; 6 men comfortably warm; foreheads damp; 4 men too warm, sweating. Sea temperature 83.
2	8.2	72	99.0.					
3	9.2	69	98.9.					
4	9.5	68	98.8	92.6.				
June 7:								
1	5.7	76	99.1		91	81	85	3 men hot, sweating; 4 men too warm; 2 comfortably warm.
2	6.1	74	99.1.					
3	6.9	71	99.0.					
4	8.1	68	99.1	93.6.				
June 8:								
1	7.2	76	99.2		89	80.5	84	8 men comfortably warm; 2 men hot.
2	7.6	73	99.1.					
3	8.8	69	99.0.					
4	8.5	69	99.0	93.6				
June 9:								
1	5.7	77	99.3	93.7	91	81	85	4 men hot, sweating; 3 men too warm; 2 men comfortably warm. Sea temperature 83
2	6.4	75	99.1.					
3	6.4	73	99.0.					
4	7.2	70	99.0.					
June 10:								
1	8.7	73	98.9	93.1	87	76	81	Air conditioned. Sea temperature 68-70. Men comfortable or comfortably cool.
2	9.3	71	98.9	91.8	84.5	70	77	
3	9.6	67	98.8	92.0	84.5	68	76.5	
4	11.0	65	98.8	91.6	83.0	65.5	75	
June 11:								
1	10.4	69	98.9	90.2	80	68	74.5	Sea temperature 62-63. Men comfortably cool. Long Beach, Calif.
2	11.2	67	98.6	90.6.				
3	12.4	63	98.5	90.4.				
4	11.9	60	98.4	89.1.				

CHAPTER 5

WATER AND ITS USES ON BOARD SHIP

For our purposes water aboard ship is obtained from two sources, viz., distilled on board or shore water stored on board. In either case the medical officer's responsibility is to make certain that the supply is at all times potable.

To insure this, frequent analysis must be made from individual tanks, and any containers used for reserve water storage must be inspected and the water changed frequently (once each month). Specimens for chemical and bacteriological examination should be submitted to shore hospitals or laboratories at 3-month intervals, if possible, and, in addition, at an early date following any casualty in the water system such as salting up, or breaks in water lines where contamination has been made possible. It is necessary to be on the alert at all times for these accidents, and to be water-purity conscious, otherwise too much damage is done before the cause is determined.

In a recent case, following a yard overhaul and drydocking, at which time all fresh-water tanks were drained, scrubbed, and painted, routine water samples were submitted to a naval hospital. Reports were not received prior to sailing for maneuvers, and on the second day at sea the medical officer noted the reporting of men for sick call with enteritis, most cases mild in degree. There were not many cases, but it was noted they came from all departments of the ship, and continued for the second day. In the evening of the second day a message was received from the hospital laboratory showing contamination of one of the three tanks with colon bacilli. The first lieutenant was at once consulted and he promptly discontinued the use of water from the contaminated tank. No new cases of enteritis were admitted following this procedure, and it was felt that a near calamity for a crew of 3,000 men had been averted.

Careful inspection revealed that there was a defective rubber gasket under the manhole plate to the tank, which allowed bilge water to enter the tank from the top, thus contaminating the entire tank. The gasket was removed, the tank drained, scrubbed, and chlorinated. After careful rinsing, the tank was again filled but no water used until samples had again been submitted and found to be free of contamination. In cases of small ships where storage facilities are limited, one would resume the use of such tanks, but if possible this water should be used for boiler feed rather than for drinking purposes. It should always be kept in mind that the ship must carry on, and the medical officer, as in all other departments, must at times devise ingenious methods of solving difficult problems in order not to allow a ship to be crippled or to interrupt its mission.

The appearance of an excessive amount of salt in the drinking water constitutes a danger signal to all hands, and is usually promptly reported to the medical officer. It has been found that in most cases this is not the result of faulty evaporators; the engineers' force is most likely to detect such an accident before it is manifested in the drinking water. This is due to the engineroom's need for properly distilled feed water, more free from salt than that needed for drinking purposes.

The experienced medical officer on reporting to a ship watches on inspection trips for any connecting water lines where salt water might inadvertently be turned into fresh water lines. It is still a common custom to have salt water piped into the spud-peeling room for the peeling machine, and into the garbage grinding machine or garbage chute. Probably as a result of recent orders forbidding the use of salt water on board for any purposes other than flushing while ships are lying in contaminated harbors, many ships will provide a connecting line from the fresh water supply to the above-

mentioned machines and facilities. Here you often find a neat connecting line—one salt water and the other fresh water—to a joint outlet. All goes well until someone unskilled in the opening and closing of valves turns salt water into the line, forgetting to close the valve from the fresh water line, thus allowing the salt water to back up into the ship's drinking water supply. Due to the pressure, it may take several days for this condition to manifest itself by taste, during which time contamination of the drinking water is slowly taking place, which may lead to serious results. The remedy is to prevail upon the first lieutenant to allow no such hookups and no connections between fresh and salt water lines. Padlocks on valves are not sufficient. Disconnection is the only sure safeguard, and should be insisted upon.

The complaint of any man on the ship that the water tastes bad should not be disregarded. The cause of the complaint should immediately be sought and trouble for an entire ship's crew may be averted. It should be kept in mind that the engineering department provides the fresh or distilled water, the first lieutenant has charge of storage and distribution, so one's problems can be shared with them.

SHORE WATER

The chief points for consideration in using shore water are source, quality, and methods of transporting. When obtained from Government stations or barges, current reports as to quality and purity are usually available and trustworthy. The medical officer will do well to be on hand when connections are made to the ship and observe that lines are intact and have not been allowed to drag through the polluted water of the harbor or other anchorage. It is advisable to look about the area and judge from appearances whether the personnel involved are experienced in such work and realize the importance of clean handling of water. Inexperience and ignorance as to the laws of general cleanliness may prove disastrous at such times. A hose carrying fresh water to a ship should at all times be kept clear of polluted harbor water.

The ship is responsible for the cleanliness of its tanks, the shore establishment is responsible for supplying pure, potable water. To determine what has been obtained, samples should be sent to a laboratory at regular intervals, and at any other time when in doubt.

In wartime one must be prepared to remedy contaminations of water supply without expending the supply on hand. This may be accomplished by chlorination in accordance with instructions incorporated in the *Manual of the Medical Department*. Reserve storage tanks for battle purposes where practicable should be cut into the water line in such a manner that there will be a continuous flow of water through the tank, thus preventing stagnation. This is feasible on shipboard, and by installing proper valves the flow through the tanks can be cut off at general quarters and an emergency outlet opened, thus providing a fresh emergency supply of water in case of damage to the ship's water lines. Tanks of 80- to 100-gallon capacity may be suspended from the overhead or secured to bulkheads as space warrants, and should be distributed throughout those areas of the ship in which personnel are concentrated at times of action.

It has been learned that not only do injured men crave water during action, but all personnel seem to develop an unnatural thirst due to nervous strain and tension. Where tanks cannot be made available, water containers such as water breakers, jugs, thermos containers and milk cans from the galley should be stored. All these require inspection for cleanliness and occasional changing of the water in them, although stale water uncontaminated is acceptable in the absence of a better supply.

Emergency tanks in sick bay and dressing stations should have not less than the equivalent in gallons of the number of personnel on board divided by five.

Water lines are so extensive on a ship that damage from bombs or torpedoes, although minor so far as ship security is concerned, may interrupt the drinking water system, thus making all hands dependent on a reserve storage supply.

USES OF WATER ON BOARD SHIP

Fundamentally the uses of water aboard ship correspond to its uses ashore—the difference being that it must be in all cases used more sparingly on board ship. The amount used is

determined by the supply and in many cases the medical officer is forced to help to determine just where the reductions can be made without jeopardizing the health of the men and the sanitation of the ship.

1. Drinking water should be the first consideration. In warm climates this requirement may be estimated at 3 quarts per day per man, remembering that men take salt tablets in these climates.

2. Bathing requires whatever amount is available from one gallon up, and though the amount may be small it is best that men have a daily bath in wartime, as action may be expected at any time. Salt water for bathing is not desirable but may be resorted to in real emergencies.

3. Galley and scullery requirements are almost constant, due to the use of dishwashing machines and sterilizing tanks on most ships. It is believed that this may be estimated at from 2 to 5 gallons per day per man depending on the size of the organization, facilities available, and method used for serving food. During action, sandwiches and cold foods are served which reduces the amount of water used for galley purposes.

4. Laundry requirements vary with the methods used. Central laundry facilities are economical in the use of water compared to the results obtained by individual work. However, in wartime it is not always feasible to spare manpower from guns and war-watches to operate a central plant, so other means must be devised.

Sick bay laundry is always an item for consideration and must be well provided for up to a real scarcity of water. At such times bed linen and towels must be conserved where possible. The turnover is so heavy on large ships that sheets and pillow cases become items of concern. Paper towels help to conserve hand towels. Pillows may be eliminated in time of stress. Clean sheets are essential.

5. The sick bay is often considered a place where extravagant use of fresh water prevails. This can easily be true, hence *don'ts* for the medical department are listed:

1. Don't allow the use of water suction for drying test tubes and pipettes in the laboratory.

2. Don't permit the use of a constant flow of fresh water through X-ray developing tanks. Use ice if necessary.

3. Don't permit the use of a large stream of water over scrub-up basins. Have small needle shower heads installed on the outlets and make sure the knee-action valves function smoothly. In cases of necessity, one can scrub in a basin and have small amounts of clean rinse water poured over the hands by an assistant.

4. Don't allow dripping faucets. Report these leaks to the first lieutenant and see that they are repaired promptly.

Save water in these places so that the galley and scullery may continue to use the needed amount to maintain proper sanitary measures in the feeding of the crew.

The use of salt water for scrubbing decks, in the spud-peeling machine, and for washing clothes is safe on ships cruising a hundred miles off shore. This distance may be reduced in areas where large centers of population do not have to be considered. However, the medical officer must be on the alert at all times when such substitutions are made to avoid such pitfalls as previously mentioned regarding the use of salt water.

Water hours are necessary on many ships, particularly transports, where ships are loaded beyond their capacity for living comfort and conveniences, and it will be found that men may keep clean and live under sanitary conditions even with limited water supply, where proper supervision by division officers is maintained.

CHAPTER 6

FOOD AND FOOD INSPECTION

In the maintenance and promotion of health, the quantity and quality of food are of the utmost importance. Food is also important in maintaining the morale and the physical and mental efficiency of fighting men on board ship, in the field, and in the barracks. Food may serve as the medium for transmission of pathogenic organisms, and diets deficient in certain substances will lead to the development of deficiency diseases. It is the function of the medical officer to give his personal concern and supervision to the condition and preparation of all food for consumption of the personnel.

The purchasing of food is centralized in the Bureau of Supplies and Accounts, and several field purchasing offices are available for food supplies. All food is purchased under Federal specifications which are prepared by a board composed of representatives of all the Government agencies concerned with food. All food is inspected upon delivery by inspectors of the Department of Agriculture or by the Navy's own trained inspectors and chemists. All provisions furnished the Navy are guaranteed by the contractor to conform to the provisions of the Federal Food and Drug Act of June 25, 1938.

Contracts for meat and meat-food products are executed sufficiently in advance to allow the deliveries to be inspected properly at the time of preparation, and upon final delivery no meats or meat-food products are accepted that do not bear the special Navy stamp and are not in compliance with Federal specifications.

It is the policy of the Navy to utilize the services of inspectors of the Agricultural Marketing Service, United States Department of Agriculture, whenever possible, in the inspection of fresh fruits and vegetables. When this is not possible, effort is made to obtain the services of other qualified inspectors of the Department of Agriculture. This also applies to inspection of poultry, butter, cheese, eggs, milk, ice cream, bread, rolls, pastry, and miscellaneous groceries.

The problem of rationing the Navy dates back to the beginning of the Navy itself. There is to be found on the statute books, an act dated March 27, 1794, which was apparently the first ration law. This act not only prescribed the allowances of different articles of food, but the particular items which would be issued on each day of the week. It was directed that on Sunday the total issue for the entire day would consist of 1 pound of bread; 1½ pounds of beef; and ½ pound of rice. Throughout the week there was little variation. Salt pork was issued alternately with beef, and peas and beans on days when rice was not issued. Potatoes or turnips were allowed on Tuesdays when they could be procured. Wednesday was a meatless day, and the ration consisted of 1 pound of bread and 2 ounces of butter, or 6 ounces of molasses; 4 ounces of cheese and ½ pound of rice. On Friday, salt fish was authorized. This apparently very meager ration was augmented by:

> And there shall also be allowed one-half pint of distilled spirits per day, or in lieu thereof, one quart of beer per day to each ration.

The ration cost about 25 cents, including the spirits. In September 1862, the rum was discontinued and the men's pay was increased five cents a day in lieu of the spirit ration.

The Navy ration has gradually improved until at the present time its nutritional value is maintained at a high standard. A supply of less than enough of any of several specific nutrients constitutes nutritional failure, and such failure leads to malnutrition. The several nutrients required by the human organism are as follows: *oxygen,* absorbed by way of the lungs from inspired air; *water,* obtained as

such by drinking aqueous liquids, also obtained from many foods, also to a small extent by oxidation of the hydrogen in fat and other non-aqueous material; calcium, phosphorus, iron and other inorganic elements which commonly are spoken of as *minerals*; certain complex organic compounds, among which are such amino acids and vitamins as cannot be manufactured in the body.

Amino acids are the building stones of protein. Food proteins vary in the amino acids they contain. In general, proteins from meats, fish, eggs, or milk meet the amino-acid requirements of man better than do the proteins of vegetable origin.

Vitamins are found in all natural or unprocessed foods, but more abundantly in some than in others. Vitamin C (ascorbic acid), for instance, lack of which leads to poor healing of wounds and ultimately to scurvy, is provided liberally by orange, grapefruit, lemon, lime, and tomato; less well by many other fruits and vegetables. It is absent in the grains and low or absent in meats. Vitamin B_1 (thiamine), lack of which results in disorders of the nervous system and ultimately leads to a polyneuritis, is well provided by grains, meats, peas, and beans, less well by other vegetables, and relatively little if at all by most fruits. Vitamin A, lack of which early affects the eyes and skin, is found in butter and cream; the provitamin carotene, which is converted to vitamin A in the organism, is richly present only in vegetables and fruits of a green or yellow color, such as carrots and apricots. The fish-liver oils alone provide much vitamin D. For this vitamin, lack of which interferes with absorption and utilization of calcium, dependence by adults is usually placed on exposure to the sun.

Two studies were made a few years ago of the nutritive value of the Navy ration. The first study was made on the basis of the food received by the personnel of a battleship during the calendar year 1940. Average nutritive values for various food groups such as meats, vegetables, cereals, etc., reported in the scientific literature, were used to calculate the nutrients received daily by each man. The second study was made on the basis of the provision requirements for 1,000 men on a 13-week cruise of the United States Pacific Fleet Base Force in 1941. Results of the two studies are shown in the following table, in comparison with the recommended daily allowances for a moderately active man as proposed by the Committee on Food and Nutrition of the National Research Council.

The values shown above for the Navy ration are on the fresh basis and do not take into consideration possible losses during storage, cooking, and canning, but it is considered that the quantities of nutrients supplied should be sufficient to cover losses of that character which might occur. It will be noted that according to present standards, the ration is adequate in all respects.

Table 4

	National Research Council recommendation	Average nutritional factors received daily by enlisted men (battleship study)	Average nutritional factors received daily by enlisted men (base force study)
Calories	3,000	4,118	4,620
Protein	70 gm.	145 gm.	130 gm.
Carbohydrate		504 gm.	611 gm.
Fat		167 gm.	180 gm.
Calcium	0.8 gm.	0.92 gm.	0.84 gm.
Iron	12 mg.	27 mg.	32 mg.
Vitamin A	5,000 I. U.	16,460 I. U.	15,125 I. U.
Vitamin B_1 (thiamine)	2 mg.	3.2 mg.	2.6 mg.
Vitamin C (ascorbic acid)	75 mg.	150 mg.	190 mg.
Vitamin B_2 (riboflavin)	3 mg.	3.5 mg.	2.8 mg.
Nicotinic acid (niacin)	20 mg.		
Vitamin D	400 units		
Percent calories as—		*Percent*	*Percent*
Protein (10 to 15 percent for well-balanced diet)		14	12
Carbohydrate (55 to 70 percent for well-balanced diet)		49	53
Fat (20 to 30 percent for well-balanced diet)		36	35

Recognizing that rations fail at times to provide an adequate supply of vitamins when troops are operating far from the home base, a capsule containing the vitamins of established significance has been made available on the Navy supply table. This capsule is prepared after a formula submitted by the subcommittee on medical nutrition of the committee on medicine of the National Research Council. Its formula is such that each capsule contains a definite fraction approximately one-half of the recommended daily allowances of vitamins for an adult man at moderate activity. Each capsule provides thiamine 1 mg.; riboflavin 1.5 mg.; niacin 10 mg.; ascorbic acid 37.5 mg.; vitamin A 2,500 I. U. and vitamin D 200 or 250 U. S. P. units.

INSPECTION OF FOOD

Fresh food not previously passed upon by a United States Government inspection should be inspected by a medical officer, and acceptance or rejection determined at once. Any food found not in accordance with purchase specifications or which may reasonably be considered to menace the health of the personnel should be rejected or recommended for destruction, as the case may be. The ship's medical officer as well as medical officers with troops in the field should regularly inspect the issue rooms, galleys, butcher shops, and bake shops, and make suitable recommendations if any unsatisfactory condition is observed regarding the storage, handling, preparation, and serving of food.

All food handlers—cooks, butchers, bakers, helpers, and messmen—should be required to keep their hands as well as utensils and implements used in the preparation and serving of foods, scrupulously clean. Strict supervision should be maintained over the health of food handlers to insure prompt detection of infectious disease.

Medical officers should receive copies of the weekly menus for the general mess and note whether or not a balanced ration is being prepared. The most frequent defect, both on board ship and in the field, is a too high percentage of carbohydrates.

When animals are purchased alive to be slaughtered by or for personnel of the Navy or Marine Corps, as may be required for a naval vessel under certain circumstances, or for an expeditionary force in the field, a medical officer should inspect the animals before slaughter and examine the carcasses after slaughter.

Ante-mortem inspection.—This inspection will eliminate animals that are immature, emaciated, feeble, crippled, appearing ill, or exhibiting skin lesions. Females in advanced state of pregnancy should be rejected. Calves should be at least 3 weeks of age before slaughter.

Post-mortem inspection.—It is essential that this inspection be made immediately after slaughter when all parts are intact, carefully inspecting serous membranes, lymph glands, tongue, viscera, glandular organs, and lungs for evidence of disease. When in doubt, it is best to reject those animals exhibiting undetermined pathological changes.

Principal diseases and conditions for which animals should be rejected are:

1. Tuberculosis.
2. Pyemia.
3. Foot and mouth disease.
4. Actinomycosis.
5. Pneumonia.
6. Inflammatory conditions of serous membranes.
7. Advanced pregnancy.
8. Recent parturition.
9. Metritis.
10. Pyometria.
11. Emaciation.
12. Abscesses.
13. Scabies.
14. Parasitic infections.
15. Icterus.
16. Melanosis.

Good, high-grade meat is dry, firm to the touch, of normal color, and free from abnormal odors. A wet, slimy, or moldy surface is indicative of beginning surface spoilage. Slime is to be found most frequently on the peritoneal and pleural surfaces or where two surfaces are in apposition. Softened areas usually indicate decomposition.

The color of choice fresh meat should be as follows:

Beef	Bright red
Veal	Pinkish brown
Mutton	Dark pink or red
Lamb	Light pink
Pork	Light pink

Abnormally dark colors are caused by advanced age, overheating or disease at time of slaughter, improper bleeding, or prolonged storage in chill rooms. Sour, putrid, or other abnormal odors are indicative of spoilage.

When decomposition of meat is suspected, the tainted portions shall be trimmed off and a probe sunk into the underlying deep tissues. If decomposition is present, the characteristic odor of putrefaction will surround the probe. A whole quarter of beef should not be condemned because a portion of it has begun to decompose, as it is often possible to trim off the tainted portion and use the remainder.

If meat is to be frozen, it should be placed in a room for 24 hours with a temperature of about 34° F. to completely eliminate body heat. Meat frozen immediately after slaughter will spoil in the deep portions.

Fresh fruit and vegetables.—When these products have not been previously inspected and do not show the proper stamp, it is important to bear in mind that they are very perishable and the surface appearance is no guarantee of the interior condition. Common defects encountered in fresh fruits are: cuts, skin cracks, worm holes, softness, skin blemishes, overripeness, and poor form. Vegetables should be free from decay, mold, frost injury, disease, blemishes, and insect, or mechanical injury.

CHAPTER 7

NAVAL CLOTHING

The following is a general discussion of the problems of clothings as they pertain to the functions of the medical officer in his advisory capacity.

Clothing promotes the efficient and comfortable functioning of the human body under varying conditions by protecting it from heat, cold, water, fire, trauma, etc.; by mitigation of climatic factors; and by aiding in the maintenance of dynamic body-heat balance. In effect, clothing acts to establish an immediate environment about the body which is more conducive to its functioning than external conditions.

For practical utilization of clothing, it is essential to appreciate the fundamental problems and relationships between the physiologic, climatic, and engineering elements involved.

PHYSIOLOGY OF BODY HEAT BALANCE

Heat is a vital byproduct of the living human body. The body balances heat gain and heat loss by varying heat production and by altering heat loss. The elements involved are graphically outlined in figure 6.

Balance, under warm environmental conditions or when heat must be dissipated from the body, is maintained by an increased blood flow to the surface of the body. This additional body heat may be brought on by work, by exercise at ordinary temperature, or by elevated temperature due to weather conditions and similar factors. The flow of blood to the body surface is increased, and the sweat glands are stimulated to activity. The activity of the sweat glands raises the moisture content and the heat is lost normally by radiation, convection, vaporization, and conduction.

Perspiration and vaporization must account for most of the body-heat loss under hot conditions, especially where surrounding surfaces possess a higher radiation value or are warmer than the body, and where air movement is at a minimum or the air is warmer than the body. Perspiration can lower the body temperature only when it evaporates from the body. If it evaporates from clothing, it may lower the temperature of the immediately surrounding air. Water of perspiration that runs off the body or is wiped off represents a loss in terms of vaporization. If the environmental air is both hot and saturated with water, all modes of heat loss are restricted, body temperature will rise, and heat stroke result.

Balance under cold environmental conditions is a problem of conservation of heat produced by the body. Sweat secretion ceases. Heat loss by vaporization is restricted to insensible perspiration through the skin, and evaporation due to saturation of inspired air in the lungs.

Heat stored in the tissues of the body protects against sudden changes incurred by external cooling. Storage supplies a specific amount of heat on demand by the atmosphere before the body itself can increase its metabolism to meet increased requirements. However, when 5 or 10 percent of this storage has been removed from the body, pain sensations begin. This is, in effect, the cold warning the body of its heat deficiency. The body, taking cognizance, increases its metabolic rate by shivering.

In acclimatization to cold conditions the principal physical adjustment involves blood redistribution. Blood flow to the skin is decreased, thus conserving vital body heat. As a result, the tissues become poorer conductors of heat in a ratio of approximately 1 to 4. This effect is most notable in the extremities. The hands and feet—especially the fingers and toes—are, therefore, the best thermostatic indicators of body temperature conditions. In these areas decreased blood flow serves the essential and quite useful purpose of reducing heat loss and enabling the body as a whole to maintain a heat balance. But in a sense the appendages are

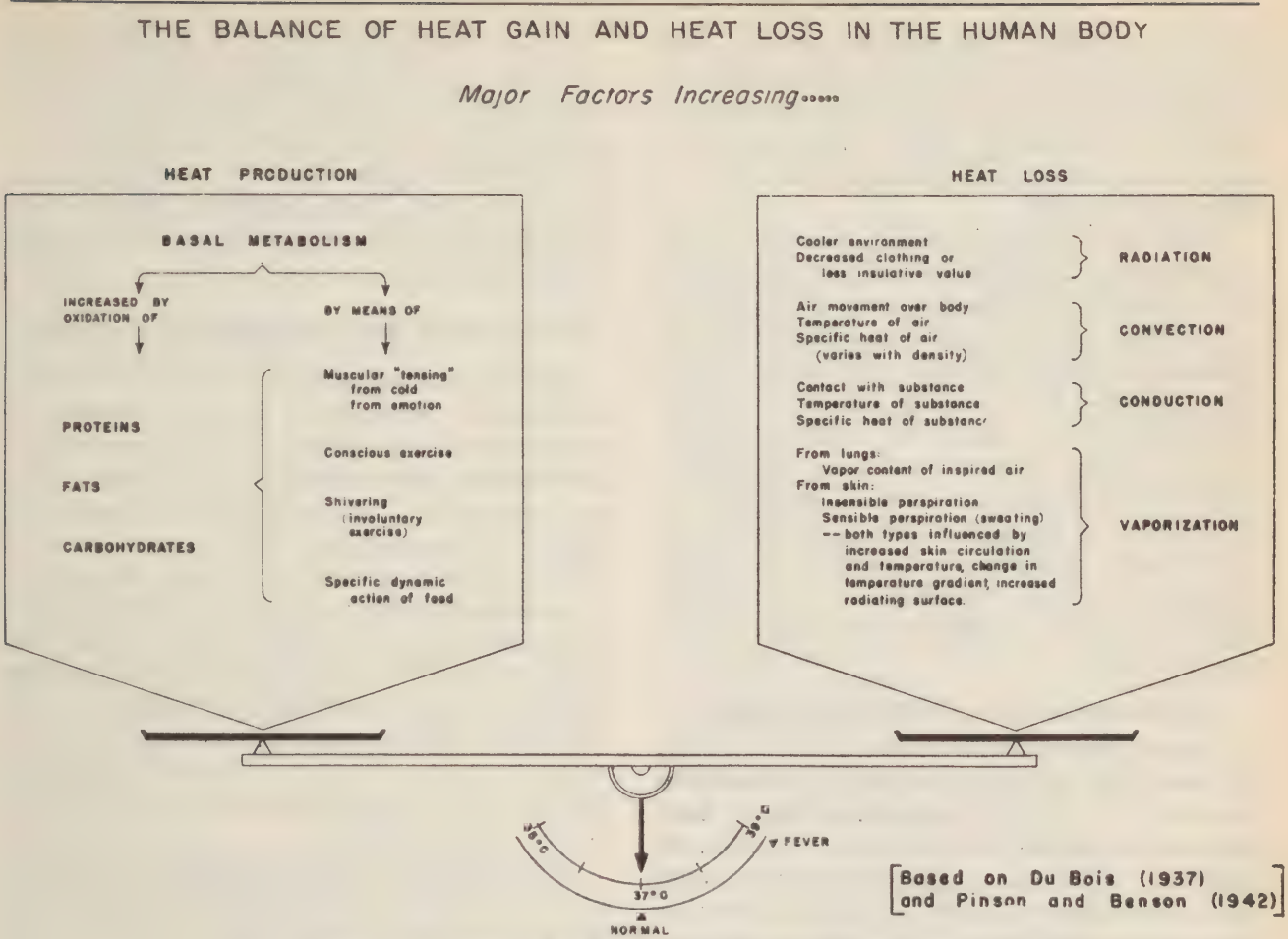


Figure 6.—The balance of heat gain and heat loss in the human body.

sacrificed, for the decreased circulation raises the minimum tolerable environmental temperature which these extremities can withstand without freezing.

As compared with persons acclimatized to cold, the extremities of the unacclimatized body are supplied with greater quantities of heat. Acclimatized persons can stand the pain of cold more readily, can dress with less body clothing, and can therefore move with greater efficiency. Paradoxically, however, they apparently will suffer cold hands and feet more quickly than the unacclimatized person when metabolic heat production drops. On the other hand the unacclimatized person, when exposed to conditions potentially lethal, will perish sooner because the same flow of heat from his body which temporarily is warming his extremities is also sapping vital heat.

Numerous other variables enter into body heat production. Unconscious tensing of muscles and shivering may increase body-heat production substantially, but the process is decidedly unpleasant. Emotional reactions, especially fear, expressly affected the thermal output of the body, and are apparently capable of increasing body-heat output by as much as 200 to 300 calories. Fatigue is an important negative factor. Illness may disrupt the entire body-heat balance mechanism by preventing the relief from fever provided by perspiration. Trauma may specifically affect localized areas of the body, and alter local thermal output. The quantity, quality, digestibility, and caloric content of food are important factors.

THE INFLUENCE OF CLIMATE

The major external variant affecting the heat production of the body is what is normally termed climate. Although it has been customary to express environmental conditions affecting body heat primarily in terms of temperature,

properly humidity, wind velocity, altitude, and varying man-made conditions also should be considered. These conditions may be enumerated as operations on board ship, below the sea, in the air, in fire rooms, in armored vehicles, and the like.

Under hot environmental conditions, excessive humidity inhibits the heat-loss mechanisms of the body. Between 90° and 95° effective temperature the limit of human endurance is normally reached, at least for periods of 3 hours or more. Wind velocity and the resulting cooling effect is a factor of considerable importance under both hot and cold conditions: under the former to be taken advantage of as a means of removing heat from the body; under cold conditions, to insulate the body against its cooling. Variations in altitude affect air pressure, availability of oxygen and temperature.

THERMALDYNAMIC ASPECTS OF TEXTILES

Textile fibers in most common use are cotton, wool, and rayon. These differ in suitability for a given purpose depending upon their physical properties such as fineness, strength, elasticity, resilience, moisture content; upon their sensitivity to chemicals such as cleaning compounds; and upon their susceptibility to organisms such as fungi, bacteria, and insects.

The thermal insulation afforded by a fabric is more dependent upon the thickness of the fabric than upon the kind of fiber. Cotton, wool, and rayon, if made into fabrics of the same thickness and of similar constructions, afford relatively the same thermal insulation. Wool, however, is particularly suitable for making thick fabrics of low density. Such fabrics contain large amounts of enmeshed air and accordingly have high resistance to the passage of heat. Thin, open-weave fabrics are cool because they allow the free circulation of air.

Fabrics differ substantially in their ability to absorb or transmit moisture and it is essential, especially under cold conditions, that perspiration, sensible and insensible, be allowed to evaporate. A dry garment, before it comes into hygroscopic equilibrium with the body and atmosphere, will absorb insensible perspiration from the body to the extent of canceling the normal 10 percent heat loss from this source.

In fact garments having a lower relative humidity than the atmosphere will attempt to absorb moisture, thereby increasing their temperature due to heat released by condensation. This absorption usually occurs within the first or second hour. Thus garments, especially of wool, not only serve as insulators, but as minor heat producers.

MAJOR TYPES AND PROBLEMS OF CLOTHING

PROTECTION FROM HEAT.—Free ventilation of the skin is essential to promote cooling by evaporation of perspiration. As a general rule hot-weather garments should be loose, thin, and lightweight. The neck should be open, the sleeves and trouser legs short.

Construction at the trunk may be avoided by shorts buttoned to the shirt, or by suspenders when a coat is worn. Longitudinal slits under the arms of the shirt and coat promote ventilation and are visible only when the arms are raised. Heavy starched clothing is impervious to air and should be avoided. Underclothing, even for persons with poor perspiration, is much to be desired.

Shorts and shirt, such as officially designated by the Navy for general tropical wear, afford little protection from insects, scratches and abrasions, or flash burns. Standard undress whites, frequently worn without the jumper, also result frequently in serious sunburn. Men on watch, at guns, and on lookout should be thoroughly protected, including sun or other helmet.

Jungle fighting in the Pacific area has clearly demonstrated the necessity of long trousers and sleeves for all types of operations. Apparently as compared to shorts, long trousers of similar material only insignificantly increase body heat.

The color of hot-weather clothing affects substantially the amount of solar radiation that will be absorbed. White will generally absorb the smallest amount of radiated energy, black twice as much.

The best interests of hygiene in the tropics are served by clothing that cannot only be readily and repeatedly washed, but that can also be sterilized or disinfected by boiling. Parasitic skin diseases are very prevalent in the tropics and it is regarded as next to impossible

to cure those caused by molds or mites without thorough and repeated disinfection of all clothing in contact with the infected skin.

Care must be taken to protect against sudden or considerable changes in temperature. After prolonged exposure to constant heat, the body becomes extremely sensitive to such changes. A drop of more than 10° F. produces a disagreeable sensation of cold, and unless warmer clothing is put on promptly a further drop may cause chilling and diarrhea.

Acclimatization in advance of arrival of troops shifted from their native climates to tropical areas is of special importance. The United States Naval Medical School suggests the following practical steps:

1. If time is available and the season is suitable, troops destined for service in the tropics should undertake a month of vigorous work in summer heat, just before sailing.

2. If time is short and the season is unfavorable, equally good results can be secured by having the men do hard work 1½ to 2 hours daily for 3 or 4 weeks in a building with controllable temperature and humidity as follows:

Simulating average tropical climate—temperature 90° F., humidity 70 percent.

Simulating average desert climate—temperature 104° F., humidity 25 percent.

Merely having the men work for 1½ to 2 hours daily for 7 days in an artificially heated building will produce good results; or having them march for 7 days at 4 miles per hour on the level, or 3½ miles per hour on a 5-percent grade, long enough to raise body temperature and pulse rate, and promote free sweating. If such daily exercises are found to be too exhausting, a rest day may be interpolated after the second and fourth days.

3. Since most well-acclimatized men tend to retain their condition for at least 3 weeks after stopping work, it is recommended that men during transit to a tropical combat area be given enough vigorous exercises each day to induce free sweating.

4. Since sweating depends on skin area, and since skin area per unit of bulk is greater in medium and thin individuals, there is theoretical objection to the stocky and large build for tropical work involving great physical stress.

PROTECTION FROM COLD.—Three layers of clothing are normally involved in cold weather protection: the underwear layer, the insulation layer, and the wind and water resistant layer. These are well illustrated by the Navy's winter clothing issues (figures 7 and 8).

1. *Underwear* is one of the most important elements of cold weather clothing. It serves as a heat filter to slow down radiation and convection and to conduct moisture away from the body. Underwear should be form-fitting, moderately dense, absorbent, lightweight, soft but with sufficient body to withstand compression. One-piece woolen underwear is preferable since it absorbs a large amount of perspiration, maintains the body in relative dryness, eliminates double insulation at the trunk and makes for more comfortable wearing.

Intense drying of all woolen clothing, especially underwear, socks, etc., increases its efficiency considerably. Frequent changing of garments, and the practice of drying at night the underwear used during the day are especially helpful.

2. *Insulation* involves usually normal clothing plus special outer wear. Figure 7 illustrates the Navy's present prescribed cold-dry-weather outfit.

Care must be exercised not to overdress because, with activity, body heat production increases. Perspiration should always be avoided. The body is unable to check the flow of perspiration water to the skin surface when skin temperature rises to about 95° F. The resultant flood of moisture dampens the clothing and tends to cool the body by added conduction. This will continue even after the need for sweating has ceased. Personnel exposed to cold conditions should learn to estimate their clothing needs in terms of environmental conditions and expected degree of activity, should attempt to underdress rather than dress for inactivity, and be prepared to take immediate steps to facilitate cooling by increased ventilation when body heat rises above the comfort level. This latter may usually be accomplished by baring the hands, which act much as an automobile radiator in cooling.

3. *Wind and water resistance* normally is a function of a third clothing layer. Approximately 75 percent of potential heat loss from the body may be due to an increase in air movement. The most effective means of reducing this loss is by creating a shell which is more or less impervious to wind. A long-staple cotton fabric of dense weave is the most efficient fabric for such purposes (figure 8).

A windproof garment reaches optimum efficiency with a combination of thin piability, minimum weight, and a density just short of



Figure 7.—The Navy's special winter clothing is designed to provide protection for personnel assigned to duty in which they are required to undergo continuous exposure to severely cold weather. The illustrated outfit consists of a two-piece woolen underwear suit with full-length sleeves and legs. This is worn under regular clothing and knee-length woolen socks. Outer garments are made of tight-woven, wool-lined jungle-cloth in dark blue. Trousers are of overall type tieing at the ankles over the arctics. The Jacket, fastened by a zipper, has woven wrist, neck, and waist bands. Gloves are one-finger, leather with wool lining. The helmet is jungle-cloth, fleece-lined, with a neck-shield. For extreme weather dark-tinted plastic goggles are supplied as well as a jungle-cloth face mask with an apron which fits beneath the jacket neck. (Outfit from Bureau of Ships; photograph by Bureau of Aeronautics.)



Figure 8.—For wet and windy weather, the illustrated garments are worn over the special winter clothing. The trousers and parka-type jacket are made of very tightly woven material, which while not entirely waterproof in the same degree as oilskins, is far more satisfactory because the material "breathes"—allows body moisture to be transferred out—but at the same time breaks the force of the wind and prevents water from saturating the insulative layers of garments. (Outfit from Bureau of Ships; photograph by Bureau of Aeronautics.)

moisture imperviousness. A windproof garment may be made water-repellent but should never be made *waterproof*, because in the latter case water of perspiration will accumulate in large quantities inside the clothing.

AVIATION CLOTHING

The problems of aviation clothing involve most of those associated with general heat and cold protection, as well as a multitude of conditions peculiar to aircraft operations. These include: weight, bulk, resistance to flame, floatation, ease of putting on or taking off, integration with equipment, ability to protect against temperature extremes, limitation of normal activity, protection afforded when forced down, and the like.

While heating of the aircraft interior remains a possibility, for practical purposes the burden of air-crew protection from cold is a matter of clothing technic, involving unheated and heated types.

Unheated insulative clothing derives its main advantages from the independence afforded each crew member from all outside heat sources under all conditions, including forced landings on cold terrain. It is frequently difficult to adjust clothing worn to the amount required by widely varying conditions. This is most acute in the case of the pursuit pilot who must don clothing on the ground—under conditions perhaps quite warm—which will protect him at high-altitude temperatures. Perspiration accumulates at ground level temperatures, making the garment uncomfortable and inefficient when cold is encountered.

Shearling—sheepskin with the wool inside —while long the main reliance for aviation suits, in actual service is at a disadvantage because of its excessive weight and bulkiness, its stiffness, relative impermeability to water vapor, and the difficulty of drying because of the necessity for coating the outside for durability. Manufactured clothes, such as cotton and wool pile, seem to be as effective in insulation and facilitate mobility of the wearer and "breathing" of the garments.

The normal reaction for a fighter pilot is to desire freedom of movement even if he gets cold. The best present padded suits, with all of their bulk, can protect at most to around +20° F. for approximately six hours. Below this temperature, and for longer periods, body-heat production must be increased. This process is complicated by the fact that it necessitates an increase in oxygen consumption and because of confined quarters it is not possible for all air crew members to exercise to the extent necessary to maintain heat balance.

Figures 9 and 10 illustrate lightweight Navy flying clothing. Figures 11 and 12 are photographs of the shearling, heavy insulative Navy flying outfit.

Heated aviation clothing permits reduction in bulk and protects against extremely low temperatures. Heat may be supplied from two sources—by circulation through the suit of air warmed by the engine; and by means of an electrical inner lining, with energy taken from the plane's power plant.

Electrically heated clothing appears to hold much promise, being used with varying amounts of insulative clothing. However, inadequate protection is afforded in case of failure of the power supply, or in case of forced landing and abandonment of the ship on a cold terrain. A substantial amount of electrical energy is needed for each suit at extremely low temperatures, even when moderate insulative clothing is used. In the case of air heating, danger of carbon monoxide poisoning is a factor, and in both types aviators balk somewhat at the necessity of external connections between their clothing and the plane. Figures 13 and 14 illustrate the Navy's adaptation of the electrically heated air crew outfit.

SPECIAL CLOTHING PROBLEMS

Protection of the extremities is more difficult than protection of other parts of the body, yet adequate provisions must be made if total body protection is not to be undermined. Principles for keeping *the feet* warm may be summarized:

1. Keep feet dry; foot coverings for use in temperatures above 0° F. and under wet conditions are usually snug-fitting and waterproofed. Perspiration is only of secondary consideration, since there is little danger of socks freezing. One or more pairs of woolen socks, preferably ribbed for greater elasticity, are indicated. They will take care of insensible perspiration. Socks should be thoroughly dry be-



Figure 9.—Navy pilot's light-weight summer cover-all. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)

fore they are put on. The standard Navy arctic is illustrated in figures 7 and 8.

2. Under extremely cold and dry conditions (below 0° F. with a slight breeze) footgear precautions shift radically from an attempt to keep moisture from entering, to an attempt to conduct moisture outside or to facilitate absorption within. Thus oil-tanned or waterproofed shoes and boots, impervious to water, are contraindicated. Experience in the polar regions, and the customs of the Russians, Canadians, Eskimos, and other northern peoples tend to the use of dry tanned leather, felt, burlap, and other similar materials. Most successful is the Eskimo mukluk. In this the sole and toe consist of a dry tan leather which remains flexible in the coldest weather. The upper, about 12 inches long, is of burlap. This is worn over two or more pair of woolen socks, between each of which is a felt inner sole. The outer covering is kept in place by tie strings loosely wound spirally and fastened above the calf. Under wet conditions, a waterproof boot may be substituted for the outer.

3. Large, roomy, cold-climate footgear is essential. Any constriction will cause a decrease



Figure 10.—Medium-weight Navy leather flying jacket and helmet. Worn with regular blue denim work outfit. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)

in the blood circulation, which circulation is of course the prime factor in maintaining body heat in the feet.

4. Feet are especially subject to freezing. As long as easy movement is had and the sensation of cold is acute, freezing is not imminent. If cramping prevents movement of the toes, and if pain of great intensity lets up without undue reason, the feet should be promptly examined. Circulation arrested by freezing or frostbite can be restored by placing them next to warm flesh. Never treat by rapid heating over a stove, by rubbing with snow, or by any strong abrasive handling. Such treatment tends



Figure 11.—Aviator donning suspender-type trousers of standard heavy insulative flying outfit. These are of shearling, fastened by zippers, and worn over regular clothing. Note the fleece seals at ankles and waist. These merge into the similar linings of boots and jacket to provide a cold-proof seal. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)



Figure 12.—The complete Navy standard two-piece aviator outfit for normal high-altitude flying. Boots are equipped with a special zipper release for quick removal if forced down in water. The outer skin of the shearling is coated and quite impervious to air. With the wool lining and with woolen underwear this disadvantage, however, may be largely overcome and a considerable amount of perspiration absorbed. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)

to aggravate the condition and to abrade the skin and set up conditions for infection. Frozen toes should be cupped in warm hands, and gentle pressure, and release of pressure should be applied until normal circulation has been restored.

Basic principles for protecting *the hands* under cold conditions are similar to those for the feet:

1. Avoid lengthy exposure, do not touch metal, snow, etc. Keep the wrists, back of hands, and palms covered as much as possible.

2. Use loose fitting woolen mittens, with separate wind-impervious coverings. Avoid use of gloves that separate the fingers, since radiation between the fingers is an important heat source.



Figure 13.—The electrically heated flying outfit of the Navy for use in extreme cold conditions and for long-range, high-altitude flights. The suit is one piece of coated leather, with an inner lining containing the heating grid. Gloves of the five-fingered type connect into the heating circuit by means of two snaps. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)



Figure 14.—Air crewman fully attired in electrically heated Naval Aviator's suit, showing electrical connection and master switch. (Photograph from U. S. Naval Air Station, Anacostia, D. C.)

3. Chilled hands frequently are the result of overheating of the rest of the body and of constriction, which prevents proper circulation of the blood. Avoid the use of garments fitting tightly on the inside of the upper arm or under the armpits, where large blood vessels come near the surface.

4. Keep the hands and hand gear as dry as possible, since moisture increases conductivity. Changing mittens when hands and mittens are wet and cold will immediately produce a feeling of warmth.

5. Freezing of hands is treated as described for feet, i. e., stimulation of circulation by gentle massage by warm hands, or of placing the hands next to warm flesh under the armpits, between the thighs, or next to the abdomen.

The head, particularly the face, is adapted to withstand a greater change of external climatic conditions than the body as a whole. The vital areas to be protected in their probable order of necessity are:

1. The ears, because of their thinness, poor circulation, and exposed location, are susceptible to quick and painful freezing. Even in moderately cold weather, earmuffs are indicated, even though the rest of the head may be uncovered.

2. The back of the neck must be protected because of the vital sensory nerve cords and tendons which lie close to the surface. The temples, forehead and throat, because of superficial blood vessels, must also be protected.

3. The top of the head—when normal hair is present—will be safe without covering down to about 0° F. if no wind is blowing, although a light covering is preferable. Air crew personnel can usually keep their heads sufficiently warm, even under severe conditions, by an outer leather helmet over the cloth inner unit (figures 9 through 14). The chief problem is that of providing comfortable support for ear phones, microphone, oxygen mask, and goggles.

4. The chin will withstand a considerable range of temperatures, but when the wind is strong it requires protection. Similarly for the nose and cheeks, but as in the case of the mouth and eyes they are difficult to shelter. Face masks are used in severe weather (figures 7 and 8).

5. The eyes offer special problems. Snow-blindness is particularly serious. No matter how strong a man may consider his eyes to be, he will succumb to snow blindness and perhaps permanent injury to his eyesight if he does not take suitable precautions. Snow blindness is caused not only by direct sunlight on the snow, but also by diffused light on a cloudy day. Polaroid glass does not help, especially since light is reflected from many planes. Goggles issued with Navy winter clothing (figures 7 and 8) are suitable for cold weather use. Glare from the sun and water in tropical regions may be somewhat mitigated by dark glasses. The antiflash eye shield in amber color (figure 16) is being used by some Navy personnel.

6. Freezing of the flesh about the face or head may proceed so quickly as to go unnoticed. At the moment of freezing a sharp twinge of pain shoots through the affected part, and it suddenly blanches white. The unwritten law, in cold countries, requires that each man call attention to his companion's face whenever he sees the appearance of an ashen area of freezing.

PROTECTION AGAINST GAS, FLAME, FLASH.—Gas-protective clothing usually consists of an over-all impregnated covering, with impregnated woolen socks and gloves, rubber overshoes and a gas mask. In emergency, almost any type of clothing which covers the entire body and is of relatively close weave may be impregnated and used more or less successfully.

Efficient flame-resisting suits which will enable damage-control measures to be taken promptly and effectively are necessities. The Navy's present fire-protection equipment is illustrated in figure 15. It should be noted that the rescue-breathing apparatus is worn on the *outside* of the suit. The rubber face piece of the apparatus should be worn under the hood of the suit, the corrugated breathing tubes protruding through the hole in the hood, with the bag outside. When the breathing apparatus is not used, an asbestos flap covers the hole in the hood.

A major and relatively new type of casualty which has made its appearance in World War II is *flash burn* from exploding bombs, explosions, and fire. Such burns were of primary concern after the Pearl Harbor attack and have been prominent in practically every action. The extent of burns is directly related to the covering afforded the body by clothing, since the injury is caused by a sudden instantaneous but intense wave of radiant heat, not by prolonged intense heat or actual flame. Thus short-sleeved shirts, open collars, and shorts are in distinct disfavor.

Flash burns at first sight rarely seem serious, appearing merely to be a slight searing of the skin. However, several hours after the blast the victim is usually found to be suffering from severe physical shock. He may lose con-

trol of the injured parts, and death may quickly supervene.

The Navy antiflash outfit is illustrated in figure 16. It consists of long, elbow-length gauntlet-type gloves and hood made of lightweight cotton, a stiffened gauze "bib" to protect the mouth, and a plastic eye-shield. Any type of other clothing may be worn, providing all areas of the body are covered. In action all personnel should be protected.



Figure 15.—The flame-resisting suit of the Navy is equipped with an efficient rescue breathing apparatus, and is considered indispensable in fire fighting for gaining access to compartments under severe fire conditions and for taking damage control measures. This outfit is light, not having wire inserts, and for practical purposes entirely fireproof. (Photographs from Bureau of Ships.)



Figure 16.—Antiflash protection is currently afforded personnel by use of this outfit, consisting of long, gauntlet-type gloves and hood made of cotton, a gauzelike mask, and a plastic eyeshield. It is fundamentally important that all portions of the body be completely covered. The neck-apron may be worn under the blouse. (Outfit from Bureau of Ships, photograph by Bureau of Aeronautics.)

The British—whose outfit is essentially similar and in fact is the forerunner of this outfit—report that in spite of the discomfort naturally associated with the outfit, little difficulty is encountered in enforcing its use, especially with personnel who have seen action. American experience has apparently not followed this pattern. Care should be taken to see that clean outfits in good order are at all times available for instant use by all members of the crew in exposed quarters.

CHAPTER 8

LIGHTING OF SHIPS

Proper lighting on board ship contributes definitely to good morale. And it is the function of the medical officer to observe and advise with regards to it. By it the health and comfort of the entire personnel is improved. There is no question but that good vision is extremely essential and that good lighting is equally as essential to protect good vision. It has been said that 85 percent of all knowledge is gained through the visual sense and at least that much of one's bodily motion is controlled by the eyes. Lighting on board ship is more important today than ever before. In war conditions, it has been found advisable to do away with all portholes, with the result that a great part of the ship's spaces and compartments must be artificially illuminated at all times.

The first question to be settled is: what is good illumination? On a bright, sunny day the level of illumination out-of-doors may be as high as 10,000 foot-candles. We seem to go about in this lighting without trouble; in fact, there is something very pleasant about it. Even on a very dreary day the number of foot-candles runs up to several hundred. Indoors presents a different picture. Spaces in a private home are frequently poorly lighted with foot-candles at best from 2 to 10. On some desks, or around special reading lights, 20 to 50 foot-candles are not unusual, but this amount of lighting is frequently spoken of as being too bright, however unfounded the criticism. It must be borne in mind that on board ship a great many of the hours of the day are spent below decks and the personnel are required to work under artificial lighting.

One of the most distressing conditions that comes from poor lighting is eye fatigue. There is nothing more disturbing to human efficiency than eye exhaustion. For example, certain researchers show that ocular muscle fatigue, produced by reading, is approximately three times as great after reading for an hour under 1 foot-candle, as it is after an hour's reading of the same printed matter under 100 foot-candles. Very often the personnel coming down into the closed spaces have been on watch for a number of hours and are already fatigued bodily. More discomfort should not be added to their weariness by producing eye fatigue through poor lighting.

GLARE.—On the practical side of good lighting is the preventing of accidents on board ship. Lighting must be of proper quality for good seeing. Glare, diffusion, direction, and distribution are all significant factors. Glare can be defined as any brightness within the field of vision of such character as to cause discomfort, annoyance, or interference with vision. It tends to injure the eye and disturbs the nervous system. It causes discomfort and fatigue and thereby reduces the efficiency of the personnel. It interferes with clear vision and again reduces efficiency, and in many cases it increases the risk of accident or injury to the personnel.

There are two common forms of glare: *direct* and *reflected.*

Direct glare is caused by excessive brightness, or high-brightness—contrast within the visual field, such as results from unshielded lamps or high-brightness surfaces of fixtures. Direct glare is very common aboard naval vessels. Much of it is caused by bare lamps scattered about passageways and living spaces. These bare lamps are too bright and are a source of constant shock to the eyes. Glare often results when there has been an effort to provide more light by increasing the wattage. Crude means of eliminating glare are very common, e.g., parchment shades over lamps in staterooms, tin and paper cone reflectors over lamps in offices. Metal troughs and shades constructed on the ship are useful but are not uniform and do not always bring about the desired results. The use of improved types of reading lamps, such as those that conform to

I. E. S. specifications are to be recommended.

Reflected glare, as the name implies, is caused by reflection from bright surfaces, such as the overhead, desk tops, and any other bright surfaces that may come within the visual field. Highly polished machine parts, smooth finished surfaces, varnished table tops, and other highly reflective surfaces are all too frequent. Reflected glare is usually more annoying than direct glare because it is generally close to the line of vision and the eye cannot avoid it. The answer here should be easy; do away with all highly polished surfaces wherever possible.

DIFFUSION AND DISTRIBUTION OF LIGHT.—Some directional and shadow effects are desirable in general illumination for accentuating the depth and form of solid objects. Generally only shadows of softer and less pronounced types should be allowed. Alternate light and dark areas in strong contrasts are undesirable, because the eye has difficulty adjusting itself to the two illuminations; under such conditions seeing becomes trying. For this reason purely local lighting, restricted to a small work area, is unsatisfactory unless there is sufficient general illumination in the room. This condition is altogether too common on naval vessels.

Structural conditions in compartments sometimes make it impracticable to provide general lighting throughout the entire space. The result is that it is necessary to have supplementary lighting at the particular points of work, either with units attached to the machines, or with units mounted from the overhead but properly located with respect to the machines. Care must be taken to see that the lighting units are not entirely those producing a closely confined beam directed solely at the work. In other words, there should be an even diffusion from the lighting source, giving as nearly as possible a unified distribution of foot-candles over the entire area and surroundings. If this is not done the man at work will have his attention focused on the brightly lighted area and each time he looks up to rest his vision, as he will do normally, his eye must adjust itself to the much darker surroundings. The result is rapid fatigue of the eye muscles. A good rule to follow would be supplementary lighting that will give 50 foot-candles and a general lighting of spaces of 10 foot-candles. At no time should the general illumination be less than 5 foot candles.

COLOR OF LIGHT.—The *white* light is the one in general use in the Navy and should be considered the desirable one. However, the so-called daylight lamps which have blue glass bulbs can be used and may be more agreeable to some people than so-called white light. One must remember, however, that it takes more wattage to give the same amount of light when the blue bulb is used.

COLOR OF SURROUNDINGS.—In general light-colored or tinted surfaces are desirable for walls and overhead. They increase the utilization of light because they reflect more light toward the working areas. The overhead, generally speaking, should be painted a flat white. A flat finish is desirable to prevent specular reflection from bright light sources which would otherwise be shielded from view. A white color provides the highest reflection factor. Certain shades of green are desirable for side walls, but it should be remembered that when the darker green is used the foot-candles on the working spaces will be reduced accordingly. Green should never be used for the overhead.

LIGHTING FIXTURES.—Lighting fixtures for naval vessels cannot be designed entirely for efficiency, good lighting, and appearance, as is possible ashore. On board ship the factors of weight, size, and strength are all-important, and very often a compromise must be made. In the turrets and handling rooms, because of the tremendous amount of piping, ducts, control cables, etc., there is no way to lay down a fixed rule for any set lighting fixtures. Safety is paramount here, and all fixtures must be designed from a safety standpoint. Even so, there is no excuse for glaring, bare lamps. In such spaces as a sick bay, dispensary, operating room, and dental office a higher level of lighting is considered necessary. There should be good general lighting with available high-intensity spot lights.

WORKING AREAS—MACHINERY SPACES, SHOPS, LAUNDRIES, CHART HOUSES, OFFICES.—Most machinery spaces can be lighted in a manner very similar to industrial interiors ashore, that is, with dome reflectors, with or without steam-

tight fittings, as the atmospheric conditions of the space may dictate.

In machine shops the lighting fixtures should be arranged with respect to the machines and located so that the men do not stand in their own shadows. Auxiliary lighting equipment should be provided for all such spaces. High illumination should be provided.

In the laundry there is little need for uniform spacing of lighting fixtures. Instead, lights should be placed with careful regard to such machines as ironers, collar machines, sorting tables, etc.

The charthouse is a good example of a space where good lighting must be provided, free from glare. It is here where men work on fine details over long periods. General lighting is desirable with good spot lighting, always remembering that the eyes must be protected from direct illumination and surfaces must be of nonspecular reflecting quality. Indirect lighting would be ideal in the charthouse because of the soft effect and freedom from shadows, but the confined space makes this difficult. A fluorescent fixture gives excellent service if it can be installed, but it is usually too bulky or cumbersome for charthouse use.

Lighting of office spaces on board ship is a difficult problem. Here, too, fluorescent fixtures are very desirable but unless they are used in desk models it seems almost impossible to find room enough to get proper installation. An effort should be made to obtain at least 30 foot-candles for desk spaces.

GALLEY, PANTRY, BUTCHER SHOP, BAKERY, SCULLERY.—In these spaces there is real need for a liberal amount of illumination, because cleanliness, accurate work, and good appearance of the products are absolutely essential. A high level of lighting is very desirable in all of these spaces and it should be provided with fixtures that do not give direct or reflected glare.

In the galley adequate light is particularly needed over the ranges, kettles, sinks, and work tables. The health of the crew may be affected seriously if cooks cannot see properly in preparing the food. Lighting fixtures should be cleaned frequently to remove the coating deposit caused by steam and vapors.

The same comment can be made on the pantry, butcher shop, bakery, and scullery insofar as good lighting means cleanliness.

LIVING SPACES—STATEROOMS, WARDROOMS, C. P. O.'s MESS.—The lighting should be such as to promote comfort and at the same time be of adequate quantity for reading and for other visual tasks. Indirect or semi-indirect lighting is greatly to be preferred, but the low overhead makes indirect lighting difficult. Supplementary lights may be provided by the use of well-constructed reading lamps.

CREW SPACES.—Here we have a difficult problem in lighting because of the considerable wattage required if adequate seeing conditions are to be made available for all of the men living in these large compartments. It is likewise impracticable to provide individual bunk lighting. Nevertheless the men will read in their bunks, regardless of whether or not the light is sufficient for reading purposes. The most practical solution seems to be to select certain sides, or corners, of the crew's spaces where the men naturally congregate for reading, writing, or card playing, and here lighting should be provided of from 30 to 50 foot-candles. General lighting should be provided in these spaces of not less than 5 foot-candles.

LIGHT SOURCES.—The incandescent lamp has been the standard light source on naval vessels for many years. The lamps designed especially for rough service have a much greater ability to stand shock than the standard lamps used ashore. They are available in from 50- to 200-watt sizes. It should be pointed out, however, that in obtaining greater ruggedness there is some loss in the efficiency of light production.

According to table 5 on page 44, it is apparent that the values of general lighting may be raised by supplemental lighting (detail illumination) to yield the values given in column 2.

The greatest upward step in efficiency of light sources has been the development of the fluorescent lamp. These lamps are quite rugged. The main problem, however, is that of supporting a relatively long glass tube so that there will be minimum breakage. Unfortunately, in the present state these lamps have to be tubular in form and supplied with alternating current for good efficiency. Fluorescent lamps have another specific advantage in that

Table 5

	NAVY SPECIFICATIONS (GENERAL LIGHTING) (Foot-candles)	AMERICAN RECOMMENDED PRACTICE (MINIMUM ON WORK) (Foot-candles)
Machinery spaces, engines, generators, etc.	5	20.
Switchboards (gages etc.)		30.
Shops—general, repair, etc.	10	20—rough work. 30—medium work.
Shops—fire control, aviation, radio	20	50—fine work. 100—extra fine work.
Shop—print	10	30 to 100.
Paint mixing	10	10.
Stowage	2	5—bulky. 10—fine.
Bakery	3	20.
Laundry	10	20.
Offices	5	25—general work. 50—long, close work.
Charthouse	5	30.
Passageways	2	5.

they efficiently produce light which is roughly comparable to daylight. We all like daylight color, for our eyes have been educated under it. The fluorescent lamp also provides cooler light. Less than half the watts are needed to give the same level of illumination as in the standard light. Furthermore, fluorescent lamps are relatively soft to the eyes, a helpful feature when bare lamps are used. The fluorescent lamp seems to be the answer in a search for better lighting conditions on board ship:

1. In the lowering of glare.
2. From the standpoint of getting additional foot-candles without great increase of electrical consumption.
3. In providing better seeing conditions.

The use of fluorescent lamps, however, presents some complications because of the peculiarities of construction on board ship. They require a great many more electrical connections than do incandescent lamps. A transformer is generally necessary, and this means additional weight; and often a starting mechanism of some kind to preheat the cathodes in the lamps further places demands upon the ship's space and tonnage.

Common sense must be used at all times when considering lighting in any form. Research is going on constantly, and during the past 2 years much has been done to utilize the red end of the spectrum of light sources. For many years battle lights were blue. Lighting of gunsights and other instrument panels has been by means of blue lights. It is a well-known fact that a blue light will be seen at a much greater distance at night than will a light that has its chief rays in the red end of the spectrum. Hence, the red light is recommended for all purposes where it is essential to maintain dark adaptation.

CHAPTER 9

THE MEDICAL DEPARTMENT ON BOARD SHIP IN BATTLE

The experiences of the medical officer in modern warfare have necessitated marked changes in the medical preparations for battle aboard all types of ships. This has been incidental to new weapons and improved methods of attack; both being factors of increased exposure of personnel manning details which are without full benefit of armor protection.

Our previous concepts that both medical personnel and material should be behind armor during battle must be abandoned to a large extent. Stringent rules against the opening of watertight doors in enemy areas make battle dressing stations below protective decks inaccessible, therefore their number must be reduced to a minimum, and be classified as *reserve* stations rather than *active* ones. Bombs and torpedoes have reduced the element of protection to a relative degree only. Means of assistance must be organized roughly on the system of land warfare, in that our trenches start on the weather decks and proceed downward to the lowest deck occupied by the personnel.

It is the function of the medical officer to bring first aid to casualties by all available means possible; expeditiously, efficiently, and adequately. Expeditious emergency treatment to casualties where found obviates their descent en masse, with assisting shipmates, upon the dressing stations, tending to cause confusion, disruption of orderly assistance, near panic and hysteria. These considerations, secondarily to humanitarianism, justify our system of taking first aid to the wounded rapidly. The ship's *watertight integrity* must not be violated, nor the *volume of fire* decreased in this process.

The prime requisite for an efficient organization is *dispersion* of both *personnel* and *material* throughout the ship at *all times*. This permits availability to as many persons as possible and despite contingencies incidental to the ship's damage. *Decentralization* cannot be overemphasized. Its accomplishment can only be attained by thorough study of each ship's compartmentation, availability of utilities, easy accessibility for the greatest number in each area, and facilities for storage of supplies at the site. The structural variations existing in the different types of ships preclude a standard plan, but all organization should essentially possess the following characteristics which are adaptable to a battleship. Modifications to suit type and size of ship must be selected.

BATTLE DRESSING STATIONS

EQUIPMENT.—This must be adequate to perform surgery and major dressings. It should include instruments, dressings, drugs, intravenous solutions, plasma, and anesthetics of local, intravenous, and spinal varieties. The location must furnish lighting systems of both emergency and normal types, power sockets for sterilizers and water heaters, water from ship's system and from emergency tanks or portable containers. Emergency toilet facilities, portable storage battery lights, canned foods, folding dressing tables, lockers, and operating table of the folding variety, or its equivalent, are needed. Additional equipment such as buckets with sand, fire extinguishers, and swabs are necessary.

The stations should be located where they can afford aid to the greatest number, be accessible and with whatever protection is compatible with their function. One, by all means, must be accessible with a minimum of effort to weather deck and casemate personnel.

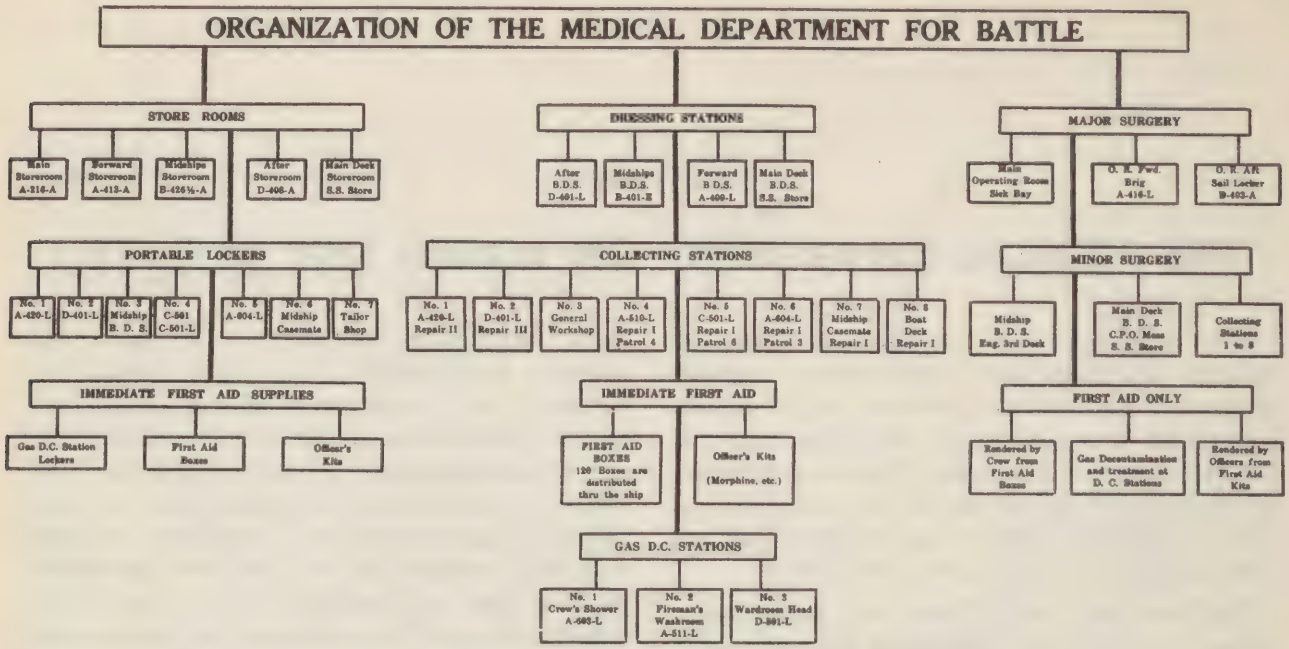


Figure 17.—Organization of the medical department for battle.

BATTLE LOCKERS

These consist of portable metal lockers as suggested in figure 18.

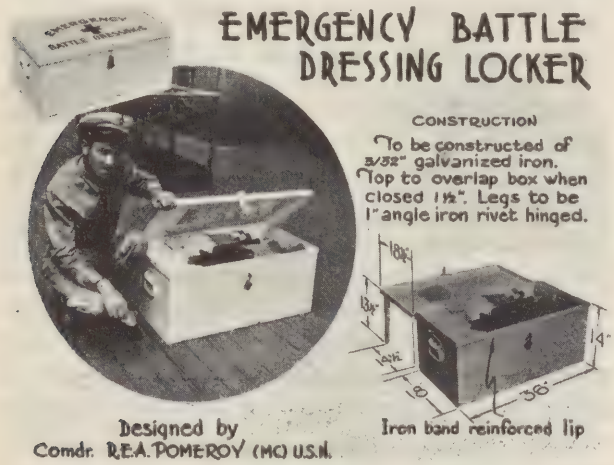


Figure 18.—Emergency battle dressing locker (Pomeroy).

CONTENTS, BATTLE DRESSING LOCKER (POMEROY)

Acid, tannic, ½ pound bottle	4
Alcohol, ethyl, ½ gallon tin	1
Applicators, bundle	1
Assorted sutures and needles	assorted
Bag, hot water, rubber	1
Bandage, gauze, 1-inch, dozen	1
Bandage, gauze, 2-inch, dozen	3
Bandage, gauze, 3-inch, dozen	2
Bandage, muslin, 4-inch	4
Battle dressings, large	20
Battle dressings, small	40
Blankets	1
Blood plasma, 250-cc. units	6
Boric acid, in gallon jug, to make a saturated solution	1
Case, forceps, hemostatic	1
Case, pins, scissors and dressing forceps	1
Case, pocket	1
Castor oil, 2-ounce bottle and medicine dropper	1
Cotton, 1-pound roll	1
Dextrose, 5 percent normal saline (vacoliters)	6
Dressings, sterile, (4 by 4) 25 in package	4
Dressings, sterile, (2 by 2) 25 in package	4
Flashlight	1
Flask, Erlenmeyer, 125-cc. (sterile)	2
Flit gun	1
Gauze, plain, 25-yard roll	3
Gentian violet, powdered, 10-gm. bottle	1
Gloves, rubber, sterile, pair	2
Jelly of tannic acid, 8-ounce tubes	12
Medicine glasses, (sterile)	2
Morphine Syrettes	40
Pencil, lead	1
Pencil, wax, red (skin pencil)	1
Petrolatum, liquid, 1-quart tin	1

Plaster, adhesive, roll (2 inches by 5 yards)	5
Procaine hydrochloride, 0.0740-gm. 100 bottles	1
Shipping tags	36
Soap solution, 16-ounce bottle	1
Splints, basswood	6
Sulfanilamide, powdered, ¼-pound bottle	4
Syringe, glass, 10-cc. sterile needle	2
Syringe, glass, 5-cc. sterile needle	1
Syringe, glass, 2-cc. sterile needle	2
Tablespoons (for retractors)	2
Test tube, with 3-inch needles	1
Tincture merthiolate, 16-ounce bottle	2
Tincture green soap, 16-ounce bottle	1
Tongue depressors, bundle	1
Tourniquet, instant, rubber	12
Towels, sterile	6
Water, distilled, 10-cc. vial	6

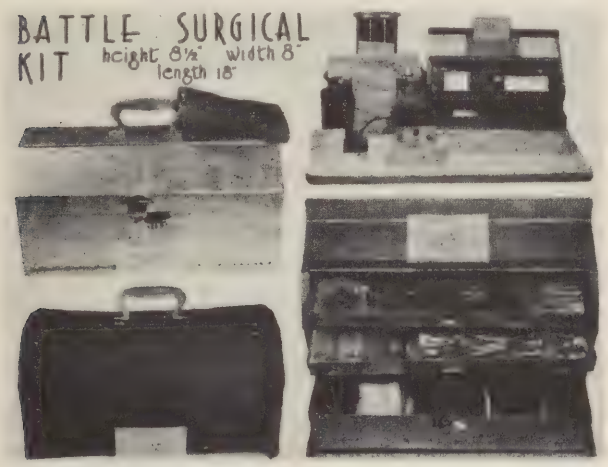


Figure 19.—Portable instrument kit (Allen).

The recommended minimum of portable lockers is 10 for battleships and aircraft carriers, 5 for cruisers, 2 for destroyers, and proportionate numbers for ships of other types. Their contents must be sufficiently complete to outfit an emergency aid or casualty collecting station, or to take care of any fairly large group of wounded cases in an isolated area.

Their distribution must be in strategic compartments throughout the ship, and independent of the battle dressing stations.

A portable instrument kit, (Allen) such as illustrated in figure 19, has many excellent features. It is made of scrap plane metal, and allows of sterilization by complete immersion or autoclaving.

BOXES—FIRST-AID

These should be the *1-cubic-foot* or *breadbox* variety for installation as subdressing stations wherever 20 or 30 men are on duty. They should contain practical first-aid materials, be portable, clearly marked with a red cross, and wire sealed for easy access. These boxes should contain morphine Syrettes at all times. A minimum of 100 in each battleship is indicated.

GUN BAGS

These should be made of canvas and attached in the immediate vicinity of all guns for use by gun crews. Contents consist of:

1. Cotton, for ears.
2. Tourniquet, rubber, instant.
3. Small dressings.
4. Bandages.
5. Tannic acid jelly (tube).

GAS-DECONTAMINATION LOCKERS

These are metal lockers with hinged table top as suggested in figure 20.

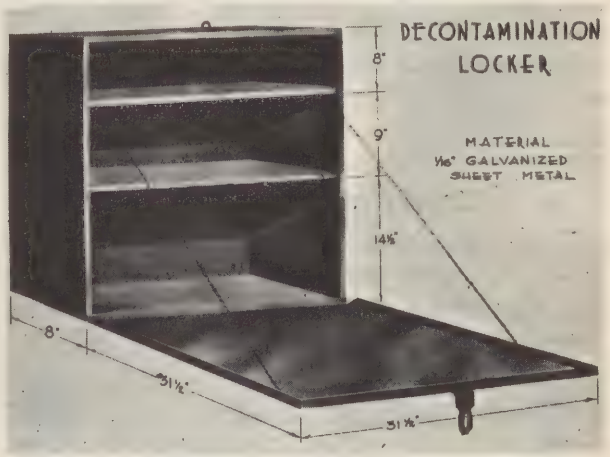


Figure 20.—Gas-decontamination locker (Maher).

CONTENTS, GAS-DECONTAMINATION LOCKER (MAHER)

Adhesive plaster, 2-inch by 5-yard rolls	2
Alcohol, ethyl, 95 percent, pint bottle	2
Applicators, bundle	1
Bandage, gauze, 2-inch, dozen	1
Bandage, gauze, 3-inch, dozen	1
Bleach paste, gallon	1
Boots, rubber, pair	1
Boric acid, 208-gm. in gallon bottle	1
Brushes, nail	6
Buckets	2

Carbon tetrachloride, gallon	1
Cotton, absorbent, 1-pound roll	1
Clothing, impregnated, suit	1
Cupric sulfate, 2-ounce bottle	1
Dressings, battle, small	24
Dressings, battle, large	3
Dressings, gauze, 6 by 8's	24
Dressings, gauze, 2 by 2's	48
Ferric hydrate paste, tin pail for	1
Ferric sulfate solution, pint	1
Gauze, plain, 25-yard roll	2
Gloves, rubber, size 8, pair	6
Irrigating can, ready for use	1
Milk of magnesia, pint	3
Mineral oil, with dropper, 100 cc	1
Petrolatum, white, can	4
Rags, cleaning, bundle	2
Salt water soap, bar	3
Sodium bicarbonate, 75 gm. in gallon bottle	1
Sodium hydroxide, 24 gm. in bottle	1
Spoon, large	1
Tannic acid jelly, tube	10
Tincture green soap, gallon	1
Tincture iodine, 3½ percent, 200-cc. bottle	1
Tongue depressors	24

Site of installation should be chosen for availability of running water, and its adaptation for rapid segregation of contaminated and decontaminated cases.

CASUALTY COLLECTING STATIONS

They should be selected in accordance with size, accessibility, and their regularly installed facilities and utilities. These spaces will be for the collection and classification of the wounded before receiving further treatment at the battle dressing station.

BURN LOCKERS

These can be made portable and stowed in previously designated compartments, with the idea of utilizing them as far as practicable for the reception, segregation, and emergency treatment of burn cases.

MAIN STOREROOM

This is situated in the compartment designated on the ship's plans. It will contain the excess medical stores for replenishment of the previously mentioned sources throughout the ship. A small *issue* space may be used as a subsidiary to the main storeroom.

BOAT BOX

The following is a list of the contents of the Navy boat box, a fixture in all boats used in abandoning ship:

Jelly of tannic acid, tube	12
Morphine Syrettes	10
Petrolatum, liquid, quart	2
Spirit of ammonia, aromatic, tube and paper cup	4
Acid, acetylsalicylic, 0.324 gm., 100	1
Extract of cascara sagrada, 100	1
Soda mint tablets, 0.324 gm., 100	1
Tincture of iodine, mild, 10-cc. applicator vial	3
Bandage compress, 2-inch	8
Bandage compress, 4-inch	1
Bandage, gauze, compressed, 1-inch	6
Bandage, gauze, compressed, 2-inch	6
Bandage, gauze, compressed, 3-inch	6
Bandage, triangular, compressed	2
Cotton, absorbent, compressed	4
Gauze, plain, compressed	6
Pins, safety, large	12
Splint, wire mesh for, 5 x 36 inches	1
Tourniquet, web	1
Sulfadiazine, 24 1-gram tablets in package	2
Sulfanilamide, powdered (for topical application), 5-gram packet	25

RAFT KIT

The understandable limitations of space aboard a life raft necessitate the following compactness:

Jelly of tannic acid, ¾-ounce tube	2
Bandage compress, 4-inch	2
Morphine Syrettes, 5 tubes; and tincture of iodine, mild, 10-cc. applicator vial, 1 vial in package	1
Sulfadiazine, 24 1-gram tablets in package	1
Sulfanilamide, powdered (for topical application), 5-gm. packet	5

PERSONNEL

DISTRIBUTION.—Medical and dental officers are assigned to each of the battle dressing stations. Hospital corpsmen are distributed as follows:

1. Battle dressing stations.
2. Repair parties.

3. As patrols on weather decks.
4. Decontamination stations.
5. Stretcher bearers (from crew).

It is preferable that they be billeted near their stations for increased decentralization and for availability at all times. Each corpsman must wear a basic equipment which is supplemented for those having topside patrols or with repair parties.

Basic equipment.—Applicable to the medical complement as a whole.

1. Hospital Corps pouch (large) with substitution of contents to suit wartime conditions.
2. Flashlight, hand, with suitable lanyard to avoid loss at all times.
3. Scissors, bandage—with lanyard.
4. Gas mask.
5. Life jacket.

Special equipment.—For corpsmen detailed to repair parties or as roving patrols on weather decks. Emergency kits or instrument carriers of a type similar to the following illustrations in figures 21, 22, and 23. Their purpose is to increase supplies for immediate use, but they must not be sufficiently bulky to interfere with locomotion, or with passage in narrow openings, or in damaged spaces.

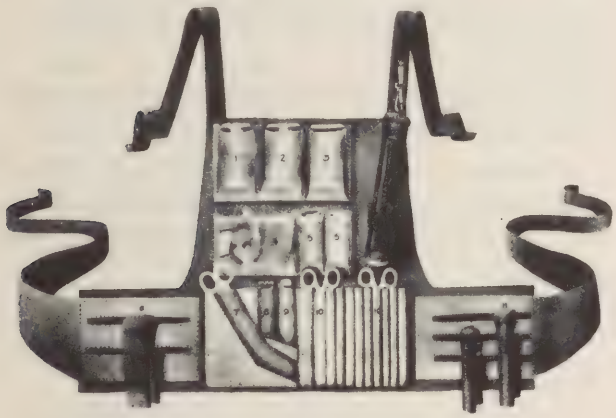


Figure 21.—Handy instrument carrier (Broaddus).

CONTENTS OF INSTRUMENT CARRIER (BROADDUS)

Pocket No.	*Item*
1, 2, 3.	Morphine Syrettes.
4.	Adhesive tape, on reel.
5.	Tannic acid jelly.
6.	Flag bunting (green) or suitable means to indicate that morphine has been given.
7.	Bandage shears.
8.	Ophthalmic ointment.
9.	Jackknife.
10.	Hemostats.
11.	Tourniquets.
12.	Flashlight.

Stretcher bearers are an important adjunct to the rendering of aid to the injured. These men should be detailed systematically, especially instructed for rendering medical assistance, and have a complete knowledge of available medical facilities and their location. The number of stretchers aboard is roughly 3 to 4 percent of complement, and consists of the Stokes, the Army litter, and *zipper* or *hammock* varieties. The number will vary with the type of ship.

The organization should be made *flexible* in every sense, both as to personnel and material. The members should be regularly instructed in their battle duties, rotated periodically in the various details to allow familiarization with all spaces aboard ship, and thoroughly taught routine treatments for the more common casualties. In this respect attention is called to *burns* which usually predominate in naval combats. It is desirable to select one recognized simple method of treatment for each ship; this avoids confusion and delay.



Figure 22.—Carry-all for first-aid supplies (Marron).

The entire ship's complement must be instructed in first aid, a highly essential feature, repeatedly demonstrated as a lifesaver in all battles of this war. Stretcher bearers will require special instructions for their duties.

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Figure 23.—Carry-all for first-aid supplies (Morrison).

The organization must be sufficiently flexible to permit rapid appropriation of improvised spaces for maximum assistance where casualties are found. By that token, the need exists for readily obtainable supplies in adequate quantities. Some special items are essential, such as morphine Syrettes in all dispersal sources, intravenous and spinal anesthetics, intravenous solutions—glucose and saline, dry blood plasma at all battle dressing stations, splints, plaster of paris, burn remedies, and large quantities of eye lotions.

Portable drinking fountains of suitable types are needed to quench the extreme thirst noted in battle. Ship's water supply lines are often broken in action.

The possible rupture of electric cables will require hand battery flashlights for each individual at all times. Thongs or lanyards are indispensable to prevent their loss as a result of sudden blows, concussions, and falls. Magazine or battery lamps for the operating tables should be furnished at the battle dressing stations. Failure of the lighting systems aboard a warship furnishes a terrible handicap, especially if accompanied by smoke or explosion gases, and damage caused by shells, bombs, or torpedoes.

Sterlization of instruments by means other than steam should be available.

Glassware, reduced to a minimum, should be protected by use of scotch tape, or its equivalent, to prevent shattering by gunfire or explosions.

CHAPTER 10

MEDICAL DEPARTMENT ON BOARD SHIP IN EMERGENCIES OTHER THAN BATTLE

Naval personnel at sea are confined within the steel wall of ships where many emergencies may occur other than those caused by battle. It is the function of the medical officer to combat these emergencies by obtaining the coordinated and concerted efforts of all personnel aboard. The following discussion present general information on the subject.

Emergencies which occur on board naval vessels frequently result in casualties both to personnel and materiel. The materiel casualties are primarily the responsibility of the damage control officer, whereas the transportation and care of personnel casualties is primarily the responsibility of the medical department.

To accomplish efficiently the mission of the Medical Department in these emergencies, careful planning followed by thorough indoctrination and drilling of all personnel is imperative.

For maximum efficiency, this planning and training should be coordinated with that of all other departments. To assure this, all watch, quarter, and station bills are prepared by the heads of departments concerned and submitted to the commanding officer for his study and approval. With this approval they become the standard practices.

The design and equipment of naval vessels render them more hazardous than their commercial sisters in carrying out their missions in peace and in war.

Listed among the more important additional hazards are:

1. Greater concentration of personnel.
2. Power plants of much greater magnitude and output.
3. General naval and military agents.
4. Special nautical hazards incidental to high speed and maneuvers in formation.

To provide for such possibilities, ship's watch, quarter, and station bills include sections on: (*a*) fires; (*b*) collision; (*c*) fire and rescue party; (*d*) abandon ship; (*e*) man overboard; and (*f*) landing force.

The medical officer of the ship prepares the watch, quarter, and station bill for the medical division.

A type bill is presented to meet these major emergencies. It covers the general principles of planning, organizing, and training for the specified emergencies.

All preparations aboard ship are now predicated on war, therefore emergencies of any nature are usually met from a general quarters set up, which this bill provides.

Included are provisions for landing exercises either in preparation for war or to assist fire and rescue parties in such emergencies as may result from major catastrophies ashore, including earthquakes, fires, hurricanes, floods, etc.

Each ship is an entity in itself because of the type of ship, individual structural characteristics, personnel, and its mission.

The following is based on a complement of 3 medical officers, 1 dental officer, and 12 hospital corpsmen.

Table 5.—WATCH, QUARTER, AND STATION BILL—OFFICERS

Name	Rank	Fire[1]	Collision[1]	Fire and rescue	Abandon ship "A" "B"	Man overboard	General Quarters			Landing Force	Watches	
							Condition 1	Condition 2	Condition 3		Port	Starboard
Senior medical officer.		MBDS(SB)	MBDS(SB)	MBDS(SB)	([2]) ([2])	MBDS(SB)	MBDS(SB)	([3])	([4])			X.
First junior medical officer.		ABDS	ABDS	MBDS(SB)	([2]) ([2])	Meet boat on its return.	ABDS	([3])	([4])		X.	
Second junior medical Officer.		FBDS	FBDS	With party	([2]) ([2])	MBDS(SB)	FBDS	([3])	([4])	Beach party.		X.
Dental Officer		FBDS	FBDS	MBDS(SB)	([2]) ([2])	MBDS(SB)	FBDS	([3])	([4])		X.	

[1] A medical officer and one hospital corpsman nearest the scene of fire or collision will report at the scene of emergency.
[2] All Medical Department personnel will assist in evacuating patients; thence to abandon ship station in accordance with ship's abandon ship bill.
[3] Medical Department personnel will be at battle dressing stations, maintaining communication watches and reducing personnel to *watch* and *watch*.
[4] Medical Department will maintain communication watches and carry on routine care of sick.
MBDS(SB)—Main battle dressing station (sickbay).
ABDS—After battle dressing station.
FBDS—Forward battle dressing station.
Abandon ship "A."—Rapid sinking; no time to lower boats. Life rafts launched where possible.
Abandon ship "B."—Slow sinking; all boats and life rafts made available.

Table 6.—WATCH, QUARTER, AND STATION BILL—HOSPITAL CORPS (SURGEON'S DIVISION)

Bunk Number	Locker Number	Name	Rating		Fire[1]	Collision[1]	Fire and Rescue
			Allowance	Actual			
		1st section					
			HM1c	HM1c	FBDS	FBDS	FBDS.
			HM3c	HM3c	1-TSP	1-TSP	With party.
			HN	HM3c	MBDS(SB)	MBDS(SB)	MBDS(SB).
		2d section					
			HM1c	HM1c	ABDS	ABDS	ABDS.
			HM2c	HM2c	2-TSP	2-TSP	With party.
			HM3c	HM3c	1-DCP	1-DCP	1-DCP.
		3d section					
			HM1c	HM2c	FBDS	FBDS	FBDS.
			HM2c	HM2c	3-TSP	3-TSP	3-TSP.
			HM3c	HM3c	2-DCP	2-DCP	2-DCP.
		4th section					
			HMC	HMC	MBDS(SB)	MBDS(SB)	MBDS(SB).
			HM2c	HM2c	3-DCP	3-DCP	3-DCP.
			HM3c	HM3c	ABDS	ABDS	ABDS.

[1] A medical officer and 1 hospital corpsman nearest the scene of fire or collision will report at the scene of emergency.

Table 6.—(Continued)

Bunk Number	Locker Number	Name	Abandon Ship "A"	Abandon Ship "B"	Man overboard	General Quarters Condition 1	General Quarters Condition 2	General Quarters Condition 3	Landing Force	Watches Port	Watches Starboard	Cleaning Station
		1st section								*1st section*		
			(2)	(2)	MBDS(SB)	FBDS	(3)	(4)			X.	
			(2)	(2)	With boat	1-TSP	(3)	(4)			X.	
			(2)	(2)	MBDS(SB)	MBDS(SB)	(3)	(4)			X.	
		2d section								*2d section*		
			(2)	(2)	MBDS(SB)	ABDS	(3)	(4)	X	X.		
			(2)	(2)	Stand by	2-TSP	(3)	(4)		X.		
			(2)	(2)	MBDS(SB)	1-DCP	(3)	(4)		X.		
		3d section								*3d section*		
			(2)	(2)	MBDS(SB)	FBDS	(3)	(4)			X	
			(2)	(2)	MBDS(SB)	3-TSP	(3)	(4)	X		X	
			(2)	(2)	MBDS(SB)	2-DCP	(3)	(4)			X	
		4th section								*4th section*		
			(2)	(2)	MBDS(SB)	MBDS(SB)	(3)	(4)		X		
			(2)	(2)	MBDS(SB)	3-DCP	(3)	(4)		X		
			(2)	(2)	MBDS(SB)	ABDS	(3)	(4)	X	X		

[2] All Medical Department personnel will assist in evacuating patients; thence to abandon ship station in accordance with ship's abandon ship bill.
[3] Medical Department personnel will be at battle dressing stations, maintaining communication watches and reducing personnel to *watch* and *watch*.
[4] Medical Department will maintain communication watches and carry on routine care of sick.
MBDS(SB)—Main battle dressing station (sickbay).
ABDS—After battle dressing station.
FBDS—Forward battle dressing station.
1-TSP—No. 1, Topside patrol, etc.
1-DCP—No. 1, Damage control party, etc.
Abandon ship "A."—Rapid sinking; no time to lower boats. Life rafts launched where possible.
Abandon ship "B."—Slow sinking; all boats and life rafts made available.

EMERGENCY DRILLS

The paramount duty of the medical department is the prompt response to and comprehensive action in the various emergencies. Therefore the surgeon's division must be indoctrinated and drilled until their state of training is thoroughly adequate and so maintained.

FIRE BILL

Alarms.

1. Word passed over loudspeakers, giving location.
2. General alarm.
3. Rapid ringing of ship's bell followed by *one, two,* or *three* strokes to indicate whether fire is *forward, amidships,* or *aft,* respectively.
4. "Fire quarters" sounded on bugle, followed by *one, two,* or *three* blasts to indicate location.
5. Word again passed over loud-speakers.
6. "Commence firing" on bugle is the signal to turn on water at scene of fire.
7. "Cease ring" is the signal to turn off water.

Duties of medical division.—The medical division will prepare to remove sick and to treat injured. A medical officer and one hospital corpsman will report at the scene of the fire equipped to treat and transport personnel casualties. The remaining Medical Department personnel will report to the sick bay.

COLLISION

Alarms.

1. One long blast on the siren.
2. Word passed over loudspeakers, giving frame number and side of ship.
3. General alarm.
4. Collision quarters on the bugle.

In a collision of some magnitude, the personnel of the battle dressing station most convenient will report, if required, at the scene of the collision to render first aid and to transport the injured, thus augmenting the damage-control party. Medical Department personnel will prepare for the reception and care of the injured.

FIRE AND RESCUE PARTY

The fire and rescue party may be called upon to assist a vessel on fire or otherwise in distress and to rescue personnel therefrom, or to render assistance on shore.

Alarms.

1. General alarm.
2. By boatswain pipes and loudspeakers:

a. "Away fire, salvage, and rescue party."
b. "Away fire party."
c. "Away rescue party."
d. "Away salvage party."

3. Boat calls on bugle followed by "Double time."
4. "Assembly" on bugle followed by "Double time."

A junior medical officer and one hospital corpsman with one large hospital corps pouch and one Stokes stretcher will attend.

ABANDON SHIP

Abandon ship may become necessary following serious underwater damage caused by collision, stranding, explosion, or damage sustained in battle. The above conditions will generally find the crew at collision quarters or battle stations.

This bill provides for abandoning ship under two conditions:

A. Rapid sinking—no time to lower boats. Life rafts launched where possible.

B. Slow sinking—all boats and life rafts made available.

General instructions.

1. The general alarm will be sounded, followed by a number of blasts on the alarm to indicate conditions A or B.
2. The *condition* will, if possible be announced over all loud speakers.
3. Life preservers will be worn by all hands for either condition.
4. All officers will wear loaded pistols for condition B.
5. The report "Ready to abandon ship" will be made as indicated hereinafter.
6. No one will either embark in boats or life rafts or jump overboard until so ordered by the commanding officer.
7. If any boat or life raft to which personnel are assigned is unavailable, the personnel so assigned will stand-by to abandon ship as ordered by the commanding officer.
8. The sick and injured, provided with life jackets, will be taken to the port quarterdeck

to assigned boats or life rafts. All medical department personnel, except those otherwise assigned, will assist in debarking patients. Sick and injured are given priority in abandoning ship.

9. Men so detailed by the medical officer will salvage valuable records.

Signals and variations in each condition:

Condition A.—Word passed: "All hands abandon ship, condition A", and when directed by the commanding officer, "All hands overboard."

All hands will jump overboard and swim clear of the ship as quickly as possible to avoid suction and may later return to life rafts or floating equipment. Sick and injured will be assisted over the side and away from the ship by all available personnel.

Condition B.—Word passed: "All hands abandon ship, condition B"; "Away all boats and life rafts."

Sick and injured will be evacuated by the medical division to the abandon-ship station designated for that purpose and debarked therefrom when directed. Personnel of the division not required to accompany sick and injured will report to their abandon-ship stations.

MAN OVERBOARD

Alarms:

1. General alarm.
2. Word passed over loud speakers.

Duties of medical division.—A medical officer will stand-by to render such assistance as may be required. A hospital corpsman with first-aid pouch will proceed "on the double" to the lifeboat to be lowered.

CHAPTER 11

TRANSPORTATION OF THE SICK AND INJURED ON BOARD SHIP

Transportation of the sick and injured aboard ship is a function of the medical officer that presents problems influenced by type of injury, condition of patient and his location aboard said ship. There are many compartments and spaces only accessible by means of scuttles, small hatches, manholes, and tortuous and narrow passageways. Some spaces are further restricted by stanchions, machinery, boilers, and lockers to a degree which presents a complicated problem of transportation to the stretcher bearer.

Necessity and ingenuity have combined to solve these by primitive manhandling, and by mechanical devices designed so far as possible for the painless, harmless extraction and transportation of casualties.

Manhandling or hand carry should be performed carefully to avoid further injury, and can be fairly safely performed by two or more volunteers.

The unconscious patient, with complicating fractures of extremities or back, will require careful assistance by means of mechanical appliances such as the following:

1. Stokes stretcher, or some of its modifications.
2. Pole stretcher.
3. Army litter.
4. Weber *zipper* stretcher.
5. Hammock stretcher (Farrar).
6. Canvas "zipper" litter (Davis).
7. Neil Robertson (British).
8. Totsuka (Japanese).
9. Hammock type (German).

Several other ingenious modifications also adequately fulfilling the purpose.

The most commonly used is the Stokes splint stretcher (figure 24-A). This stretcher is a galvanized iron or aluminum stretcher basket so constructed that immobilization of body and lower extremities is possible, thereby allowing a thoroughly secured patient to be hoisted in an upright position through hatches and manholes if necessary, or permit of transfers from ship to ship at sea by means of any suitable hoisting apparatus available. The disadvantages are its rigidity and width when used in compli-

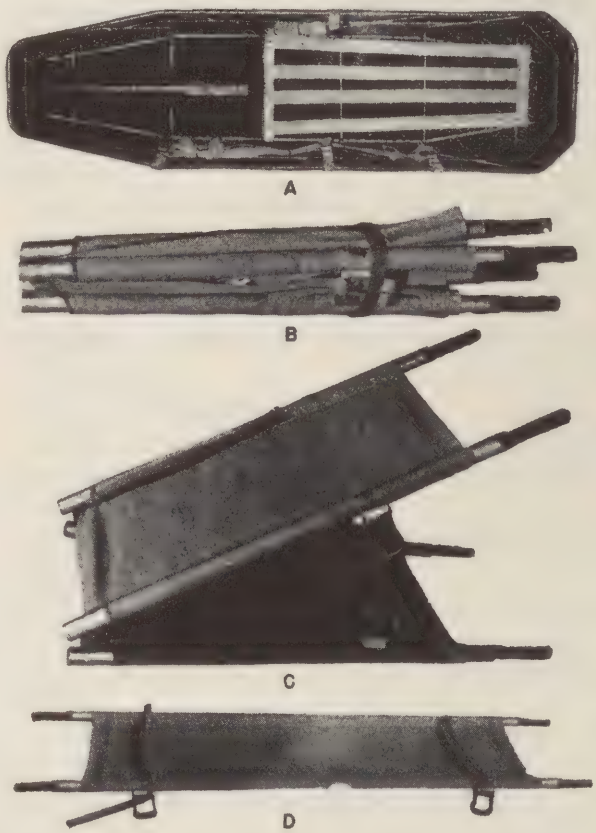


Figure 24.—A, Stokes splint stretcher; B and C, Pole litter, folding; D, same nonfolding.

cated spaces, such as escape hatches, narrow tortuous passageways, turrets, handling rooms, and machinery spaces. It is an excellent, safe, comfortable means of transportation. Some modifications have improved the original design

by slightly changing its shape, decreasing weight, and by articulation in its middle for better storage. It is provided with hand grips for hand carry or for attaching a bridle for hoisting. A septum separates the legs, which can be secured for immobilization. Adjustable foot rests permit the body weight to be carried by one or both legs in the upright position. Canvas straps are used to retain the patient firmly in position. These straps should always be attached, rolled neatly and simply to allow rapid securing of patient.

The Army-type litter (figure 24) and its counterpart as improved, articulated, and made much lighter for field and shipboard use, is also



Figure 25.—Modified "gas pipe" stretcher king.

available. It can be used only when no difficulties of transportation are present and when the patient will not be exposed to the possibility of falling. These can be employed as temporary beds when a major casualty has exhausted the usual facilities. Hence 20 or 25 of these should be in each battleship with a proportionate number in smaller crafts.

The removal of injured or sick from areas difficult of access is accomplished by the use of flexible apparatus, with or without some immobilizing features, and usually made of canvas. One of these is the Weber *zipper* stretcher or *zipper stretcher suit* (figure 26). The procurement of zippers may be difficult, due to priorities, in which case grommets and white-

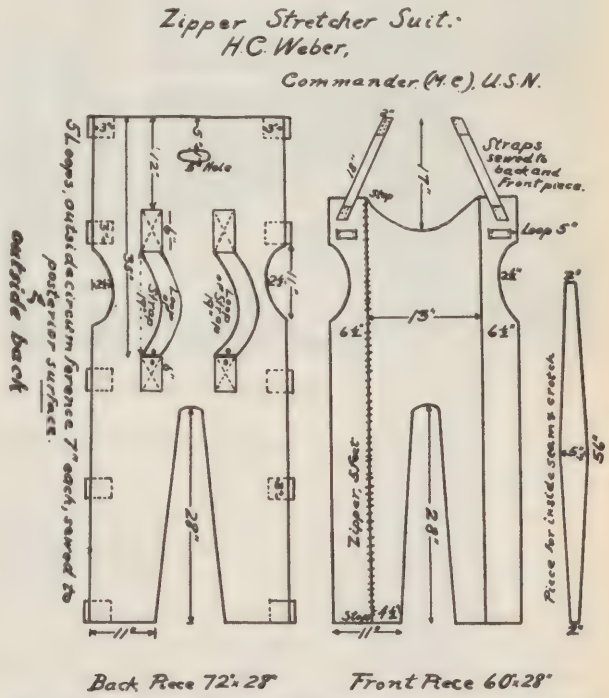


Figure 26.—The front of the suit consists of three pieces of canvas, two side, and one center. The side pieces are identical, 60 by 6 or 7 inches. The lower edge is straight. The upper edges form a downward curve with the centerpiece as illustrated to allow room for the neck. The center piece of the front is 13 by 55 inches, a little longer at the outer edges to meet the line from the side pieces. The lower part is cut out to conform to the dimensions of the back piece canvas of the legs. To give extra room in the crotch, a piece of canvas, 5 inches at the widest portion—i.e., the crotch—and gradually tapering off to 2 inches, is sewed between the front and back piece of the legs. See drawing. To the inside of the crotch is sewed a pad of hair-felt horizontally, dimensions 10 by 6 by 2 inches.

line lacing may be substituted. The effects of salt air, weather, and encroaching clothing may cause failure of zippers to function.

A simple, easily made canvas *hammock stretcher* is illustrated. Hammocks are always available aboard ships, and the stretcher may be easily folded for storage at strategic spots. Its method of use is shown in figure 27.

Another simple canvas appliance having many uses is shown in figure 28.

The Germans used an ordinary hammock (figure 29-C) with beckets placed at the outer quarters to allow some overlapping for security; three beckets on each side, two near the head,

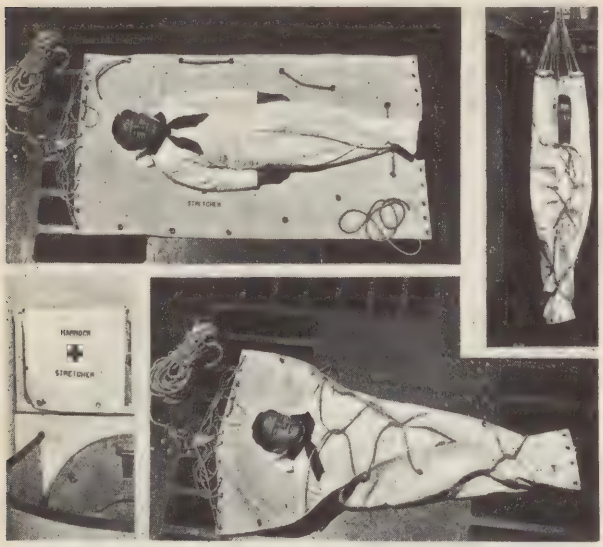


Figure 27.—Hammock stretcher (Farrar).

and canvas straps securing patient by crossing at perineum.

The Neil Robertson stretcher (figure 29-B) used by the British is light, serviceable, made of canvas, and reinforced by bamboo. It allows splinting for carrying, may be suspended vertically and hung as a hammock. The Japanese Totsuka stretcher (figure 29-A) is fairly similar in construction. All canvas appliances are strictly for shipboard use unless they are further equipped with loops for the introduction of poles which convert them into rigid stretchers. A tendency is to employ heavier canvas than needed, and to overlook the necessity of a rope attached at all times for assistance in lifting from lower decks or lowering from fighting tops.

Transportation of sick and injured involves transfers at sea from one ship to another, or rescues of survivors from the ocean. Smaller ships such as destroyers are preferable for use because of their speed and low free-board. Cargo nets may be thrown over the side, thereby making it possible for survivors, not severely injured, to climb aboard. Much assistance can be rendered by the ship's company in this manner.

A member of the Medical Department will assist greatly by classifying and distributing the casualties as they come over the side. This will prevent confusion and unnecessary crowding in the sick bay or in spaces previously prepared for the reception of specific types of injuries.

Should there be many severely injured cases, these can be expeditiously handled from ship to ship by means of appliances quickly improvised by the rescuing ship. One of these is the construction of a platform with raised edges, and suspended from slings. It is preferably made to carry three stretchers at a time, and equipped with securing lines for lashing which will afford additional protection against sliding. The edges of the platform must be sufficiently high to equal the depth of a Stokes stretcher.

A breeches buoy may be used for transfer of slightly wounded from ship to ship if, for military reasons, it is necessary to do this underway.



Figure 28.—Simple canvas stretcher (Davis).

Two- or three-litter-capacity lifting rods consisting of two 1¼-inch galvanized pipes, the ends of which have been flattened and drilled with a ½-inch hole, may be used as in figure 30. The poles (pipes) are 51 inches for the two-lift, and 73 inches for the three-litter, and are passed through the legs of Army type stretchers. Patients on Army litters must be thorough-

ly secured to prevent their falling. This is accomplished by the use of canvas straps, bunk straps, or single-ply canvas, 12 inches by 72 inches, cut to form three-tailed ends 16 inches long, and tapering to 2 or 3 inches wide at the ends. These are passed under the stretcher and the three opposing ends are tied across the patient's abdomen.

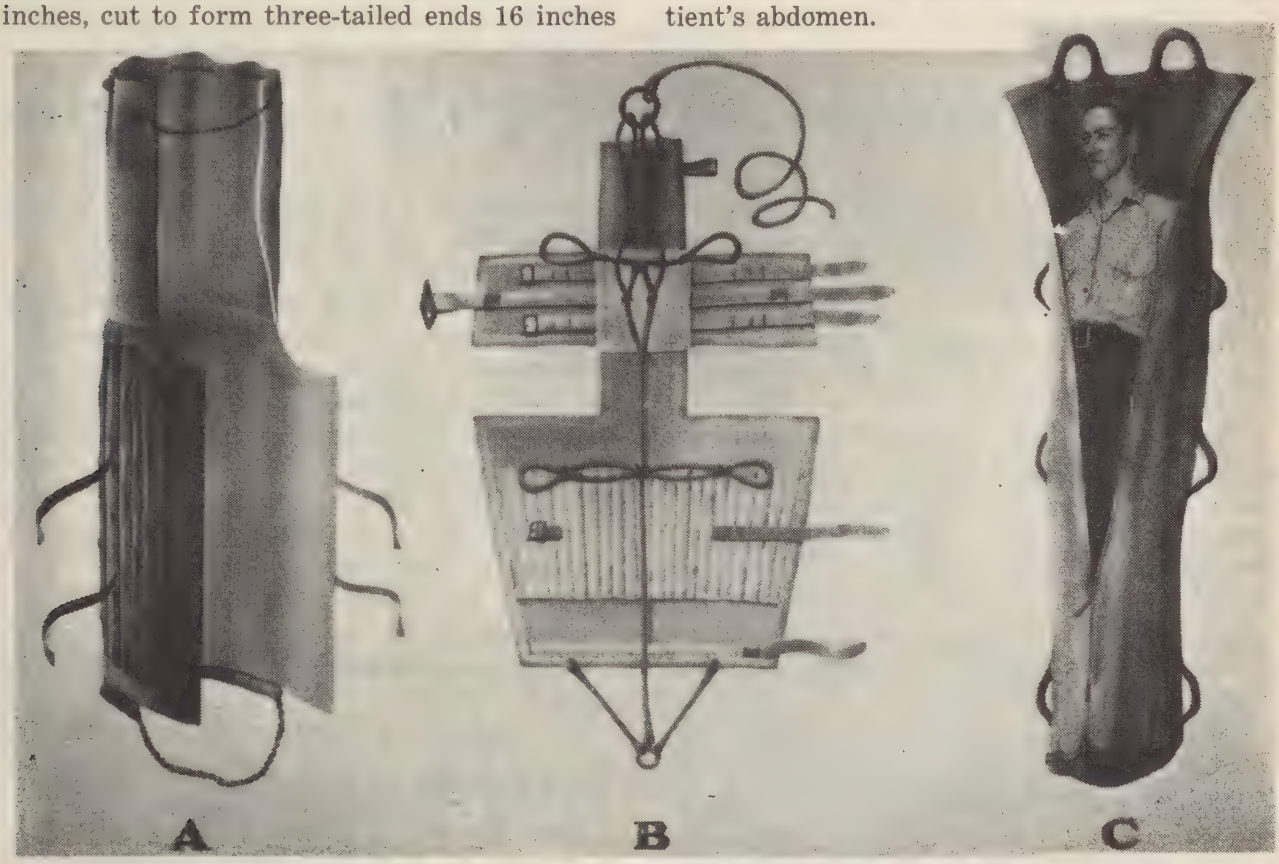


Figure 29.—A—Totsuka stretcher. B—Neil Robertson stretcher. C—German hammock type.

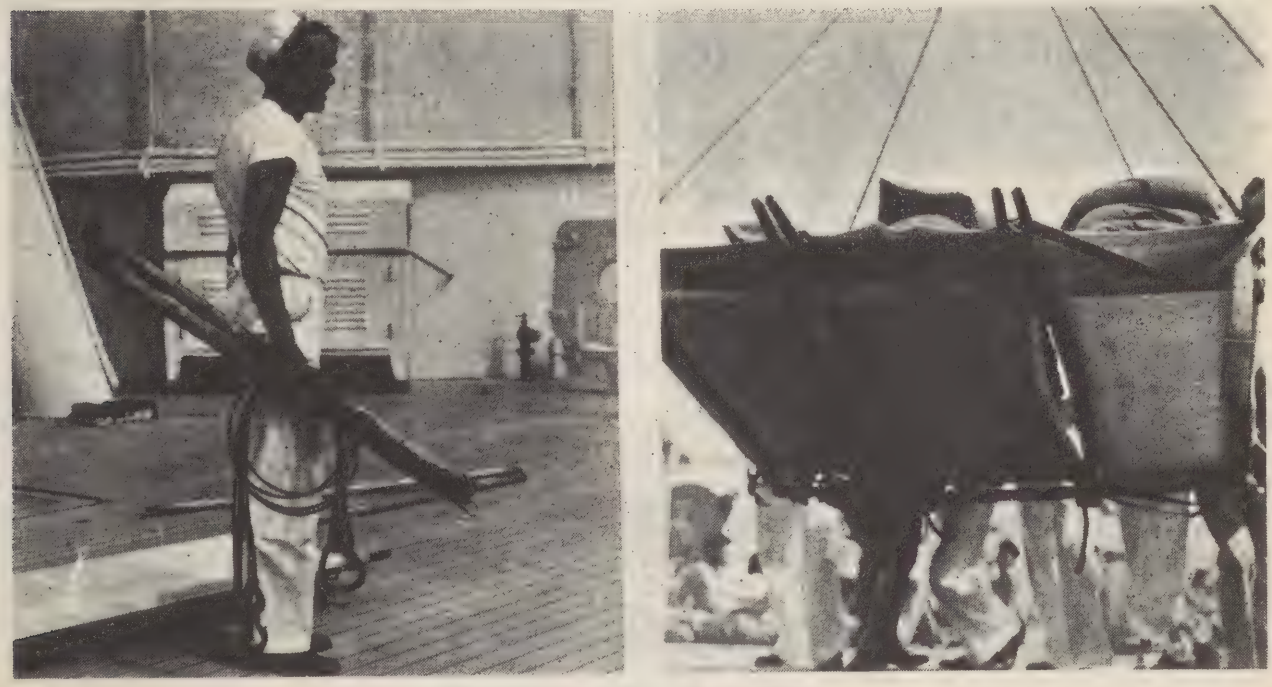


Figure 30.—Litter lifting rods (Broaddus).

CHAPTER 12

PREVENTIVE MEASURES AGAINST DISEASES AND ACCIDENTS

Both a physical hazard and faulty human behavior are necessary for an accident to happen. Full attention must be given to both. It is the duty of the medical officer to use every means of eliminating or reducing the physical hazard, and in addition do everything possible to control the human behavior.

Wherever accident frequency and severity are kept under control, the fundamental principles of scientific accident prevention must exist. These are: the creation and maintenance of active interest in safety; periodical inspections of machines, tools, equipment, processes, and work procedures; accident investigation for the determination of causal facts; and corrective action based on these facts.

The creation and maintenance of active interest in safety as a first principle of accident prevention must apply to officers as well as to the men.

From the standpoint of the first lieutenant, the medical officer, and division officers, a job of salesmanship is necessary. To arouse and maintain the interest of a person it is necessary to appeal to one or more of his stronger senses or desires such as: self preservation—appeal to the individual's fear of personal injury; desire for personal gain or reward; loyalty to one's commanding officer, division officer, and to shipmates; sense of responsibility to one's job, division, shipmates, and to ship.

A health and safety program should be organized on every ship, and safety committees appointed in each division to assist the first lieutenant and medical officer with the program. Frequent talks should be given to the men on the subject accident prevention and its importance. Posters, pamphlets, slides, motion pictures, and articles in ships' papers should be utilized.

Periodical inspections to locate and identify physical hazards are exceedingly important. The following list of basic items that should be looked into is used by a safety engineer of long experience:

Housekeeping, which includes inspection for loose material and objects underfoot or overhead, method of piling, projecting nails, disposal of scrap and waste, grease, water or oil spillage, and tool maintenance.

Material and store handling methods.

Guarding of transmission machinery.

Point of operation guards.

Decks, ladders, railings.

Cranes, hoists and derricks.

Lighting.

Electrical equipment, particularly extension cords.

Eye protection from harmful light, rays, heat or glare, flying objects, splashes of corrosive substances, etc.

Other personal protective equipment: In certain types of work men need respirators, life lines, life jackets, safety shoes, special gloves and other protective clothing.

Dusts, fumes, gases, vapors.

Ventilation of storerooms and confined spaces.

Pressure vessels.

Any other fire and explosion hazards, as volatiles, gases, chemicals.

Other dangerous substances.

Inspection of chains, cables, slings, etc.

Access to overhead valves, equipment, etc.

The above list is limited almost wholly to physical hazards because the discovery and correction of unsafe working practices requires continuous watchfulness and painstaking training and education.

Every disabling accident aboard ship should be investigated immediately for *cause analysis* and not for the sole purpose of fixing blame. All minor accidental injuries and as many near-injury occurrences as possible should also be investigated. Continuous analysis of operations

and jobs to discover and permit the correction of hazardous conditions should be maintained. The purpose of accident investigation is to find hazardous conditions and practices that can be corrected so as to prevent the recurrence of similar accidents.

Principles of accident investigation that should be followed to secure maximum results include the use of common sense and clear thinking in collecting facts, weighing the value of each, and reaching conclusions justified by the evidence. Sufficient familiarity with the equipment, operation, or process to permit an understanding of possible hazards that may exist, is essential. Each clue and factor, even when apparently of little importance, should be fully investigated. Since a physical hazard and faulty human behavior are both present in the majority of accidents, both must be considered fully. After an accident investigation, if a definite recommendation for corrective action is not made then, the investigation was not satisfactory. Immediate investigation of all accidents is necessary because conditions may change quickly and details be forgotten.

Corrective action should be based on available and pertinent facts and may include a consideration of any of the following:

1. Personal:

a. Instruction, enforcement of instruction or education.

b. Protective equipment and devices, such as respirators, goggles, life lines, and protective clothing.

c. Prevention or at least reduction of amount of exposure to hazards.

2. Medical:

a. Periodical physical examination.

b. Salt intake for prevention of heat reactions.

3. Mechanical:

a. Ventilation, general or local exhaust.

b. Change, enclose, or isolate harmful proccesses.

c. Substitute less toxic for toxic material.

d. Adequate guarding of all moving parts of machinery likely to injure someone.

e. Adequate natural or artificial lighting according to the type of work or operation being performed.

f. Revise any operation that can be done in another, safer, and better manner.

The Navy proceeds with the belief that dangerous material can be handled safely and that any mechanical job can be performed safely if proper study is given in advance and the necessary precautions observed.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Actinomycosis	1. Recognition by clinical manifestations confirmed if possible by microscopic examination of discharges from lesions.	1. Quarantine: None.	1. Concurrent disinfection of lesions and articles soiled therewith.
	2. Isolation: None.	2. Immunization: None.	2. Terminal disinfection by thorough cleaning.
		3. Instruction regarding oral hygiene.	3. Check possibilities of exposure to infected cattle or use of infected milk.
Angina, Vincent's (stomatitis, Vincent's), (gingivitis, Vincent's).	1. Recognition on clinical manifestations with or without bacteriological confirmation.	1. Inspection of mouth and throat.	1. Check on efficacy of dishwashing facilities.
	2. Isolation: None.	2. Correction of abnormal or diseased conditions of gums and teeth.	2. Check against possible use of common drinking cup.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	3. Correction of abnormal or diseased conditions of gums and teeth.	3. Instruction in regard to diet (particularly in reference to vitamin C), gum massage, use of dental floss and the tooth brush.	3. Concurrent disinfection: All discharges from nose and throat.
	4. Instruction in regard to diet (particularly in reference to vitamin C), gum massage, use of dental floss, and the tooth brush.	4. Quarantine: None. 5. Immunization: None.	4. Terminal disinfection: None.
Anthrax	1. Recognition by clinical and (if possible) bacteriological means.	1. Check possible contact with infected hides, wool, hair, bristles.	1. Concurrent disinfection of discharges from lesions (spores can be killed only by such measures as burning or steam under pressure).
	2. Isolation: Until the lesions have healed.	2. Quarantine: None. 3. Immunization: None.	2. Terminal disinfection: Thorough cleaning. 3. Search for the source of infection (hides, wool, hair, bristles of infected animal).
Ascariasis	1. Recognition by identification of ova lumbricoides, ascaris, in stools.	1. Quarantine: None.	1. Concurrent disinfection: Sanitary disposal of feces and washing hands in soap and water after defecating and before eating.
	2. Isolation: None. 3. Suitable treatment with appropriate agent such as hexylresorcinol, and of chenopodium or santonin should reduce the communicability of the disease.	2. Immunization: None.	2. Terminal disinfection: None.
Catarrhal fever including: Bronchitis, acute; common cold; laryngitis, acute; pharyngitis, acute; rhinitis, acute; tracheitis, acute; tracheobronchitis, acute.	1. Recognition on clinical manifestations. 2. Isolation: During febrile period.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection of the discharges from the nose and throat or articles soiled therewith.
Cerebrospinal fever (meningitis, meningococcus).	1. Recognition on clinical manifestations, confirmed if possible by microscopic and bacteriological examination of spinal fluid as well as bacteriological examination of nasal and pharyngeal secretions.	1. Quarantine: None.	1. Concurrent disinfection of the discharges from the nose and throat or articles soiled therewith.
	2. Isolation: Until 14 days after onset of the disease or until negative swabs are obtained from the nasopharynx.	2. Advise contacts to avoid as far as possible for 10 days excessive chilling, bodily fatigue, physical strain.	2. Terminal disinfection: Cleaning.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	3. Prompt treatment with an appropriate chemotherapeutic agent such as sulfadiazine or sulfanilamide should be useful in limiting communicability.	3. Observation of nonimmune contacts daily for 10 days following last date of contact unless bacteriological studies of nasal and pharyngeal secretions negative. 4. Prophylactic use of an appropriate chemotherapeutic agent such as sulfadiazine or sulfanilamide in the close contacts may be helpful. 5. Immunization: None.	3. Increase separation of individuals and discourage crowding. 4. Improve ventilation of living and sleeping quarters.
Chancroid including: chancroidal lymphadenitis.	1. Recognition by clinical manifestations and exclusion of syphilis and lymphogranuloma venereum ((a) Withhold local medication until 3 negative dark-field examinations, carried out on successive days, have been obtained; (b) do Frei test for lymphogranuloma venereum if possible; (c) do a blood serologic test for syphilis and repeat every month for 6 months after healing of lesions.)	1. Quarantine: None.	1. Concurrent disinfection: Sanitary disposal of all dressings, disinfection of all articles soiled by discharges.
	2. Isolation: Place on "venereal restricted list" and refuse all shore leave until lesions heal.	2. Immunization: None.	2. Terminal disinfection: None.
	3. Education: Stressing (a) that continence is compatible with health and normal development; (b) that prophylaxis is available and advisable if self-control has failed and promiscuous sexual intercourse has occurred. 4. Proper treatment with saline dressings alone the first 3 days followed by appropriate chemotherapeutic agents such as sulfanilamide locally and sulfathiazole or sulfadiazine systemically should render a patient noninfective in 14 days in most instances.	3. Search made for infected person from whom patient received infection. Report made to proper authorities to bring about control and treatment of this spreader.	3. Check against common use of towels and toilet articles.
Chickenpox (varicella)	1. Recognition by clinical means only (be meticulous to eliminate the possibility of smallpox).	1. Quarantine: None.	1. Concurrent disinfection: Articles soiled by discharges from lesions.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: From all nonimmune until all blebs are dried but not necessarily until all scabs are shed.	2. Immunization: Passive immunization, in exceptional cases only, of nonimmune contacts with intramuscular injection of 2 to 10 cc. of serum from a patient 4 to 6 weeks convalescent from chickenpox. 3. Observation every second day of all nonimmune contacts through period of 21 days. 4. No observation of contacts presumably immune.	2. Terminal disinfection: Thorough cleaning.
Cholera	1. Recognition by clinical symptoms confirmed if possible by bacteriological examination of stools.	1. Quarantine: Contacts for 5 days from last exposure, or longer if stools are found to contain the cholera vibrio.	1. Concurrent disinfection: Prompt and thorough disinfection of stools and vomitus. Disinfection of articles used by or in contact with patient. Food left by the patient should be burned.
	2. Isolation: In sick bay or screened room for 7 to 14 days and until cholera vibrios are absent from bowel discharges.	2. Immunization: Prophylactic reimmunization of ship's personnel with 1 cc. "booster dose."	2. Terminal disinfection: Thorough cleaning of entire room and the contents. 3. Search for unreported cases or carriers. 4. Investigate water, milk, food—chlorinate all water, cook all food.
Coccidioidomycosis	1. Recognition on clinical manifestations confirmed by bacteriological examination if possible of the fresh discharges.	1. Quarantine: None.	1. Concurrent disinfection: All discharges from skin lesions or necrotic lymph nodes and all sputum and articles soiled therewith.
	2. Isolation: None.	2. Immunization: None. 3. Instruction regarding importance of obtaining prompt treatment of all skin wounds, even trivial ones.	2. Terminal disinfection: Not important.
Dengue	1. Recognition by clinical manifestations. 2. Isolation: In sick bay or screened quarters for 5 days.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection: None. 2. Terminal disinfection: None. 3. Search for unreported or undiagnosed cases. 4. Measures to eliminate the *Aëdes aegypti* mosquito and its breeding places.
Diphtheria	1. Recognition by clinical symptoms with confirmation, if possible, by bacteriological examination of discharges.	1. Quarantine: All contacts who handle food until shown by bacteriological examination not to be carriers.	1. Concurrent disinfection: Of all articles soiled by discharges from patients, and all articles that have been in contact with patient.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: Until 2 cultures from the throat, and 2 from the nose, taken not less than 24 hours apart, fail to show the presence of diphtheria bacilli. Where termination by culture is impracticable, terminate at 16 days after onset.	2. Observation: Daily for 15 days following last exposure.	2. Terminal disinfection: Thorough cleaning or renovation and thorough airing and sunning of sick room.
		3. Immunization: All Schick-positive contacts should be actively immunized with toxoid (in order to minimize local and constitutional reactions it is desirable to make a preliminary "toxoid reaction test," nonreactions to receive multiple small doses of suitably diluted toxoid).	
Dysentery, balantidic (amebic).	1. Recognition by clinical symptoms confirmed, if possible, by microscopic examination of stools.	1. Quarantine: None.	1. Concurrent disinfection: Sanitary disposal of bowel discharges. Hand washing after use of toilet.
	2. Isolation: None (but patients should be instructed regarding hand washing and forbidden to handle food to be eaten by others until repeated microscopic examination of stools shows absence of the *Entamoeba histolytica*).	2. Immunization: None.	2. Terminal disinfection: Cleaning.
		3. Microscopic examination of stools of work associates of patient.	3. Search for direct contamination of water and food by human feces.
			4. Check against possibility of water pollution by cross-connection and back-flow connection.
Dysentery, bacillary.	1. Recognition by clinical symptoms; confirmation if possible by laboratory tests.	1. Quarantine: None.	1. Concurrent disinfection of all bowel discharges. Hand washing after use of toilet.
	2. Isolation: During acute phase of disease and until the dysentery bacilli are absent from the bowel discharges. Food handling forbidden until stools negative.	2. Immunization: None.	2. Terminal disinfection: Cleaning.
			3. Search for contamination of water, milk and food by human feces.
Encephalitis, lethargic	1. Recognition by clinical symptoms assisted by microscopical and chemical examination of spinal fluid if possible.	1. Quarantine: None.	1. Concurrent disinfection of discharges from the nose, throat, and bowel, and articles soiled therewith.
	2. Isolation: For 1 week after onset.	2. Immunization: None.	2. Terminal disinfection: None.
		3. Search for unreported cases amongst shipmates.	3. Take such steps as are practicable in controlling or preventing contact with mosquitoes.
		4. Observation of close contacts every 2d day for 21 days.	

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Erysipelas	1. Recognition by clinical manifestations confirmed if possible by bacteriological means.	1. Quarantine: None.	1. Concurrent disinfection: Discharges from lesions and articles soiled therewith.
	2. Isolation: Until lesions are completely healed. 3. The use of appropriate sulfonamides may reduce the communicability.	2. Immunization: None.	2. Terminal disinfection: Thorough cleaning.
Favus	1. Recognition on clinical manifestations confirmed if possible by microscopic examinations of crusts and cultures on Sabouraud's medium.	1. Quarantine: None.	1. Concurrent disinfection: Toilet articles of patient.
	2. Isolation: Yes, until skin and scalp lesions are healed and microscopic examination is negative. Patient should wear a tight-fitting cotton skullcap which is boiled frequently.	2. Immunization: None.	2. Terminal disinfection: None.
		3. Instruction of contacts to report to medical officer the occurrence of any scalp lesions.	3. Check against use of common hair brushes and combs.
Filariasis	1. Recognition on clinical manifestations — confirmation by finding embryos in blood after symptoms have occurred.	1. Quarantine: None.	1. Concurrent disinfection.
	2. Isolation: Not practicable because of prolonged period of communicability. Patient should be made inaccessible to mosquitoes.	2. Immunization: None.	2. Anti-mosquito measures particularly against *Culex fatigans*: screening of all sleeping quarters with screens eighteen mesh to the inch. 3. Terminal disinfection: None.
Fungus infection of the skin (ringworm).	1. Recognition on clinical manifestations.	1. Quarantine: None.	1. Concurrent disinfection. Cleanliness of body and underclothes. Use of cotton socks which can be boiled. Use of formaldehyde or powdered acetylsalicylic acid for disinfection of shoes.
	2. Isolation: No, but severe cases should be excluded from common bathing facilities until condition reasonably well cleared.	2. Immunization: None.	2. Terminal disinfection: None. 3. Survey of common bathing facilities to assure all precautions being taken.
German measles (rubella).	1. Recognition by clinical manifestations.	1. Quarantine: None.	1. Concurrent disinfection: All articles soiled with the secretions of nose and throat.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: From onset of catarrhal symptoms or rash until disappearance of rash.	2. Immunization: None. 3. Non-immune contacts of first cases should be observed every second day (particularly looking for post-auricular nodes) for 21 days from the last day of exposure. Observation of contacts when the disease is epidemic is probably futile.	2. Terminal disinfection: Thorough cleaning.
Glanders	1. Recognition by clinical manifestations followed if possible by the complement fixation test, the mallein test, the agglutination test or the Straus reaction and confirmation by culture and identification of *Bacillus mallei*.	1. Quarantine: None.	1. Concurrent disinfection: Discharges from patient and articles soiled therewith.
	2. Isolation: Yes, until bacilli disappear from discharges or until lesions have healed.	2. Observation of close contacts daily for 5 days. 3. Immunization: None.	2. Terminal disinfection: Thorough cleaning. 3. Search for any infected horses.
Gonorrhea including: Gonococcus infection, all types.	1. Recognition by clinical manifestation confirmed, if possible by bacteriological examinations. In absence of laboratory facilities treatment of acute purulent urethral discharges should begin anyway, a smear for subsequent examination first being procured.	1. Quarantine: None.	1. Concurrent disinfection: Discharges from lesions and articles soiled therewith.
	2. Isolation: Placed on "venereal restricted list" and refused all shore leave until discharges disappear.	2. Immunization: None.	2. Terminal disinfection: None.
	3. Patient instructed regarding care of hands and discharges until declared cured. 4. Education: Stressing (a) that continence is compatible with health and normal development, (b) that prophylaxis is available and advisable if self-control has failed and promiscuous sexual intercourse has occurred. 5. Proper treatment with appropriate chemotherapeutic agents such as sulfathiazole or sulfadiazine should be useful in limiting communicability.	3. Search made for infected person from whom patient received infection. Report made to proper authorities to bring about control and treatment of the spreader.	3. Check against common use of towels and toilet articles.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Hookworm disease	1. Recognition by clinical manifestations confirmed by finding ova in feces. 2. Isolation: None. 3. Treatment with tetrachlorethylene, hexylresorcinol or carbontetrachloride should reduce the communicability.	1. Quarantine: None. 2. Immunization: None. 3. Education as to dangers of spread through soil.	1. Concurrent disinfection: Sanitary disposal of bowel discharges to prevent contamination of soil and water. 2. Terminal disinfection: None.
Impetigo contagiosa	1. Recognition on clinical manifestations. 2. Isolation: Yes, until pustules are healed. 3. Instruct contacts to report any skin lesions promptly to medical officer.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection: Santary disposal of dressings and moist discharges from lesions. 2. Terminal disinfection: None. 3. Check against use of common towels.
Influenza	1. Recognition by clinical symptoms only (very difficult in interepidemic periods). 2. Isolation: During acute stages of disease, especially in severe cases and those complicated by pneumonia.	1. Quarantine: None. 2. Immunization: None. 3. Instruction: Report promptly to physician if feeling feverishness.	1. Concurrent disinfection: Discharges from nose and throat. 2. Terminal disinfection: None. 3. Increase separation of individuals and reduce crowding. 4. Improve ventilation of living and sleeping quarters. 5. Check efficacy of dish washing facilities.
Jaundice epidemic (Weil's disease).	1. Recognition on clinical manifestations (confirmation if possible by isolation of Leptospirae from blood or urine and positive serological tests). 2. Isolation: None.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection. Urine and other discharges of the patient. 2. Terminal disinfection: None. 3. Check rat-control measures. 4. Protect workers in infected water, with boots and gloves.
Leprosy	1. Recognition on clinical symptoms confirmed by microscopic examination where possible. 2. Isolation: Yes, transfer to national leprosarium as soon as possible.	1. Quarantine: None. 2. Immunization: None. 3. Search made for infected person from whom patient received infection.	1. Concurrent disinfection: Discharges and articles soiled with discharges. 2. Terminal disinfection: Thorough cleaning of patient's quarters.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Lymphogranuloma venereum.	1. Recognition on clinical manifestations (diagnosis should be confirmed by Frei antigen intradermal test). 2. Isolation: Placed on "venereal restricted list" and refused all shore leave and the handling of all food as long as there are open lesions on the skin or mucous membranes. 3. Education: Stressing (a) that continence is compatible with health and normal development, (b) that prophylaxis is available and advisable if self-control has failed and promiscuous sexual intercourse has occurred. 4. Proper treatment with appropriate chemotherapeutic agents such as sulfathiazole, sulfadiazine or sulfanilamide may be useful in limiting communicability.	1. Quarantine: None. 2. Immunization: None. 3. Search for case of origin particularly among prostitutes, among persons of Negro race, and among former residents of tropical and subtropical areas. Report made to proper authorities to bring about control and treatment of this spreader.	1. Concurrent disinfection: Discharges and articles soiled therewith. 2. Terminal disinfection: None. 3. Check against common use of towels and toilet articles.
Malaria	1. Recognition by clinical manifestations always confirmed if possible by microscopical examination of the blood. 2. Isolation: From mosquitoes only. 3. Proper treatment with appropriate chemotherapeutic agents such as quinine, atabrin and/or plasmochin should be useful in limiting communicability.	1. Quarantine: None. 2. Immunization: None. 3. Administration of suppressive doses of quinine or atabrin for all those who have been or still are exposed to *Anopheles* mosquitoes. (0.2 grams (3 grains) atabrin twice a week or 0.3 gram (5 grams) quinine sulfate daily.	1. Concurrent disinfection. None. Destruction of *Anopheles* mosquitoes in patient's quarters. 2. Terminal disinfection: None. Destruction of *Anopheles* mosquitoes in patient's quarters. 3. Killing mosquitoes in all living quarters. 4. Screening sleeping and living quarters (use of screening at least 16 wires to the inch).
Measles (rubeola)	1. Recognition on clinical manifestations with special attention to rise of temperature, Koplik spots, and catarrhal symptoms in exposed individuals.	1. Quarantine: None.	1. Concurrent disinfection: All secretions of nose and throat and articles soiled therewith.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: During the period of catarrhal symptoms and until the cessation of abnormal secretions.	2. Observation: Of all nonimmune contacts daily for period of 21 days. 3. Immunization: Not as a rule. In exceptional cases injection nonimmunes with 3 to 6 cc. of immune globulin or 20 to 50 cc. of the whole blood of immunes or 4 to 10 cc. of convalescent measles serum, within 5 days after first exposure may be used with the hope of averting an attack.	2. Terminal disinfection: Thorough cleaning.
Mumps (parotitis, epidemic).	1. Recognition on clinical manifestations. 2. Isolation: For period of swelling of a salivary gland.	1. Quarantine: None. 2. Observation: All exposed nonimmunes daily for period of 21 days from date of last exposure. 3. Immunization: None. (Passive temporary immunization by convalescent serum or blood may be used.)	1. Concurrent disinfection: None. 2. Terminal disinfection: None.
Paratyphoid fever	1. Recognition on clinical manifestations confirmed, if possible, by specific agglutination test or by bacteriological examination of blood, bowel discharges or urine. 2. Isolation: In flyproof room until repeated bacteriological examination of discharges shows absence of the infecting organism.	1. Quarantine: None. 2. Immunization: Exposed susceptibles to be reinoculated with "booster dose" of triple typhoid vaccine (0.1 cc. intracutaneously)	1. Concurrent disinfection of all bowel and urinary discharges and articles soiled with them. 2. Terminal disinfection: Cleaning. 3. Check sanitation of water, milk, shellfish, or other food. 4. Check for unreported cases or carriers among food handlers.
Pediculosis	1. Recognition by direct inspection for lice and nits. 2. Isolation: Yes; until lice are destroyed and nits removed from hair. 3. Proper treatment should be useful in limiting communicability.	1. Quarantine: None. 2. Inspect heads, bodies and clothing contacts.	1. Concurrent disinfestation: Such washing of person and treatment of body clothing and toilet articles as will destroy lice and nits. 2. Terminal disinfestation: None. 3. If infestation found general, institute disinfestation procedure for entire personnel of ship.
Plague (bubonic) (pneumonic).	1. Recognition by clinical manifestations confirmed if possible by; (a) bacteriological examination of blood or pus from glandular lesions, or sputum; (b) animal inoculation.	1. Quarantine: Of all contacts of pneumonic cases for 7 days take temperatures every 12 hours.	1. Concurrent disinfection: Sputum and articles soiled therewith in pneumonic type of disease.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: In a screened room free from vermin until complete recovery (masks, gowns and gloves must be worn by those coming in contact with case).	2. Immunization: Reinoculation of ship's personnel with "a booster dose" of 1 cc. plague vaccine is indicated. Those not previously immunized should have the full course of immunization.	2. Terminal disinfection: Thorough cleaning followed by fumigation to destroy rats and fleas. Bodies of persons dying of plague to be handled under strict antiseptic precautions. 3. Check rat proofing of ships and presence of fleas.
Pneumonia (lobar) (primary, atypical).	1. Recognition by clinical manifestations. Bacteriological and serological tests should be done if possible. 2. Isolation: Yes, until sputum no longer carries the infectious agent. 3. Prompt treatment with an appropriate chemotherapeutic agent such as sulfadiazine may be useful in limiting communicability.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection: Discharges from nose and throat of patient. 2. Terminal disinfection: Thorough cleaning and airing. 3. Increase separation of individuals and discourage crowding.
Poliomyelitis	1. Recognition by clinical manifestations assisted if possible by microscopical and chemical examinations of the spinal fluid. 2. Isolation: Yes, for 2 weeks from onset.	1. Quarantine: No (but nonimmune exposed food handlers must not handle food to be eaten uncooked for 14 days from last exposure). 2. Observation: Of all nonimmune close contacts daily for 14 days from last exposure. 3. Immunization: None.	1. Concurrent disinfection: Nose, throat, and bowel discharges, and articles soiled therewith. 2. Terminal disinfection: None.
Psittacosis	1. Recognition by clinical manifestations. Confirmatory laboratory tests usually not available on board ship. 2. Isolation: Yes, during febrile and acute clinical stage. (Those handling patients with a cough should wear masks with 8 layers of gauze 40-48 threads per inch or 16 layers of gauze 20-24 threads per inch).	1. Observation of close contacts of patient daily for period of 15 days following last exposure. 2. Immunization: None.	1. Concurrent disinfection: Of all discharges. 2. Terminal disinfection: Thorough cleaning. 3. Quarantine: Quarters which housed infected birds should be quarantined until thoroughly cleaned and disinfected. 4. Incriminated birds should be killed, their bodies immersed in 2 percent cresol, their spleens aseptically removed, part placed in equal parts of sterile glycerin and standard phosphate buffer solution of pH 7.5, and part in a suitable fixative and both specimens sent to the nearest available laboratory for examination. Carcasses should be burned before feathers dry.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Rabies	1. Recognition of disease by clinical symptoms confirmed if possible, by examination of brain of animal for Negri bodies and by animal inoculations with material from the brain of such animal.	1. Quarantine: None.	1. Concurrent disinfection of saliva of patient and articles soiled therewith.
	2. Isolation: None if patient is under medical supervision and attendants are warned of possibility of inoculation by human virus.	2. Immunization: None.	2. Terminal disinfection: None.
	3. Immunization: Semple vaccine should be given promptly to patient bitten or mouthed over by animal seriously suspected of being or proved to be rabid.		
Rat bite fever	1. Recognition of disease by history of rat bite and symptoms. Means of laboratory confirmation rarely available on ship board. Prompt cure by arsphenamines is of diagnostic value.	1. Quarantine: None.	1. Concurrent disinfection: None.
	2. Isolation: None.	2. Immunization: None.	2. Terminal disinfection: None.
			3. Rat eradication and prevention of rat bites.
Relapsing fever	1. Recognition by clinical symptoms, confirmed if possible by laboratory means; curative action of arsphenamines also confirmatory.	1. Quarantine: None.	1. Concurrent disinfection: None.
	2. Isolation: None.	2. Immunization: None.	2. Terminal disinfection: None.
			3. Tick and louse eradication.
Rocky Mountain spotted fever.	1. Recognition by symptoms and history of tick bite or exposure to ticks. A positive Weil-Felix reaction during the second week of illness is a valuable confirmatory aid.	1. Quarantine: None—not communicable from man.	1. Concurrent disinfection: All ticks on the patient should be destroyed.
	2. Isolation: None.	2. Immunization: Active artificial immunization by Spencer-Parker vaccine has given very encouraging results.	2. Terminal disinfection: None.
			3. Tick infested areas should be avoided as far as feasible; ticks should be promptly removed from person; hands should be protected when removing ticks from animals.
Sandfly fever (pappataci fever).	1. Recognition by symptoms and history of exposure to bite of sandfly (genus phlebotomus).	1. Quarantine: None.	1. Concurrent disinfection: None.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
	2. Isolation: No; but every effort should be made to prevent infection of *Phlebotomus* by preventing them from gaining access to the patient during the first day of the disease.	2. Immunization: None.	2. Terminal disinfection: None. 3. Sandfly-infested areas should be avoided as far as possible. 4. Electric fans placed at openings will aid in preventing entrance of the flies. Screens must be 45 mesh to the inch to be effective. 5. Repellents may be helpful.
Scabies	1. Recognition by clinical manifestations. 2. Isolation: Yes; until itch mites and eggs are destroyed.	1. Quarantine: None. 2. Search contacts for unrecognized cases.	1. Concurrent disinfestation: Yes; of body clothing and bedding. 2. Terminal disinfestation: Underclothing and bedding to be so treated by dry heat or washing as to destroy the mites and the eggs.
Scarlet fever	1. Recognition by clinical symptoms; Schultz-Charlton blanching phenomenon may be helpful. 2. Isolation: Yes; until all abnormal discharges have ceased and all open sores on wounds healed (at least 21 days from onset). 3. Observation of all close contacts daily for week following last exposure with isolation of those with sore throat or upper respiratory infection until their symptoms have cleared.	1. Quarantine: No (exclusion of nonimmune food handlers from their work for period of 7 days from last day of exposure). 2. Immunization: (Usually none. In very special cases passive immunization by the injection of human convalescent serum or scarlet fever antitoxin in Dick-positive contacts).	1. Concurrent disinfection: All articles that have been in contact with patient and all articles soiled by discharges of patient. 2. Terminal disinfection: Thorough cleaning. 3. Study of possible milk or food source.
Schistosomiasis	1. Recognition on clinical manifestations and if possible by microscopical examination of the stools or urine for ova. 2. Isolation: None. 3. Treatment with sodium antimony tartrate, fuadin or other trivalent antimony compounds should reduce communicability.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection: Sanitary disposal of feces and urine. 2. Terminal disinfection: None. 3. Protect workers in polluted waters with boots, gloves, and other waterproof garments.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Septic sore throat	1. Recognition by clinical manifestations aided if possible by bacteriological examination of the lesions or discharges. 2. Isolation: Yes, until cured (exclusion from food handling until throat cultures clear of helmolytic streptococci).	1. Quarantine: None. 2. Immunization: None. 3. Observation of close contacts daily for period of 3 days from last exposure.	1. Concurrent disinfection: Articles soiled with discharges from nose and throat of patient. 2. Terminal disinfection: Cleaning. 3. Investigate milk supply.
Smallpox	1. Recognition by clinical manifestations. 2. Isolation: In screened quarters, free from vermin until patient has recovered and all scabs and crusts have disappeared.	1. Immunization: Revaccination immediately of entire personnel of the ship. 2. Quarantine: For those contacts vaccinated within 24 hours of first exposure, quarantine until height of reaction is passed. For those contacts not vaccinated within 24 hours of first exposure, quarantine for 16 days from last exposure. 3. Meticulous search for prior case, particularly checking cases previously diagnosed as chickenpox.	1. Concurrent disinfection: Of all discharges. No articles to leave the surroundings of the patient without boiling or equally effective disinfection. 2. Terminal disinfection: Thorough cleaning and disinfection of quarters.
Syphilis	1. Recognition by clinical manifestations confirmed by microscopical examinations of discharges and by serum reactions. 2. Isolation: Placed on "venereal restricted list" and refused all shore leave until non-infectious. (Infectiousness is not to be predicated on a blood test result, but upon the total time of course, laboratory tests, physical inspection, and treatment summation of the case). 3. Education: Stressing (a) that continence is compatible with health and normal development; (b) that prophylaxis is available and advisable if self-control has failed and promiscuous sexual intercourse has occurred.	1. Immunization: None. 2. Quarantine: None. 3. Search made for infected person from whom patient received infection. Report made to proper authorities to bring about control and treatment of this spreader.	1. Concurrent disinfection of all 2. Terminal disinfection: None. discharges and articles soiled therewith. 3. Check against common use of towels and toilet articles.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Tetanus	1. Recognition by clinical manifestations confirmed if possible by bacteriological means. 2. Isolation: None.	1. Quarantine: None. 2. Immunization: All wounded or tetanus-exposed persons should be given a "booster dose" of ½ cc. of alum-precipitated tetanus toxoid intramuscularly.	1. Concurrent disinfection: None. 2. Terminal disinfection: None.
Trachoma	1. Recognition on clinical manifestations. 2. Isolation: Not necessary if patient is receiving appropriate chemotherapy and is properly instructed regarding precautions against spread of secretions of the eye to others by common use of articles.	1. Quarantine: None. 2. Immunization: None. 3. Search contacts for previously unrecognized cases. 4. For closest contacts the prophylactic use of suitable agents such as solution of zinc sulfate (1 percent), or copper sulfate (0.5 percent) may be useful as an eye wash.	1. Concurrent disinfection: Of discharges and articles soiled therewith. 2. Terminal disinfection: None. 3. Check against common use of towels and toilet articles.
Trench fever	1. Recognition on clinical manifestations with history of exposure to the bite of the body louse. 2. Isolation: In vermin-free quarters until clinical recovery (recovered cases may remain infective to lice for several months).	1. Quarantine: None. 2. Immunization: None. 3. Through disinfestation of all contacts of patients.	1. Concurrent disinfection: Destroy all lice and louse eggs on hair, clothing, and bedding. Disinfection of urine and saliva and articles soiled therewith. 2. Terminal disinfection: None.
Trichinosis	1. Recognition on clinical symptoms and marked eosinophilia aided if possible by intradermal and precipitin tests. Confirmation by muscle biopsy after third week. 2. Isolation: None.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection: None. 2. Terminal disinfection: None. 3. Every effort should be made to trace source of infection in pork and pork products. 4. Check thorough cooking of meat.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Tuberculosis (pulmonary) including: Tuberculosis, skin.	1. Recognition by clinical signs and symptoms confirmed by bacteriological examinations. 2. Isolation: None (but patients with open lesions must be forbidden to handle food).	1. Quarantine: None. 2. Immunization: None. 3. Special search for possible original source.	1. Concurrent disinfection: Discharges and articles freshly soiled with them. 2. Terminal disinfection: Cleaning. 3. Special investigation of milk source.
Tuberculosis (pulmonary) including: Tuberculosis, general miliary.	1. Recognition by use of X-ray followed by thorough physical examination supplemented by tuberculin testing when necessary and confirmed by bacteriological examination of sputum and other materials. Physical examination alone can rarely diagnose incipient case. 2. Isolation: Of "open" cases.	1. Quarantine: None. 2. Immunization: None. 3. All contacts of an "open" case should be examined roentgenologically. This should be repeated after 6 months.	1. Concurrent disinfection of sputum and articles soiled with it. 2. Terminal disinfection: Cleaning and renovation.
Tularemia	1. Recognition by clinical manifestations confirmed by bacteriological and serological means if possible (skin reaction less reliable). 2. Isolation: None.	1. Quarantine: None. 2. Immunization: None.	1. Concurrent disinfection of discharges from the ulcer, lymph nodes, or conjunctival sac. 2. Terminal disinfection: None. 3. Special investigation of prevalence of blood-sucking flies and ticks, of possibility of use of raw drinking water, of the dressing of wild game without gloves.
Typhoid fever	1. Recognition by clinical manifestations confirmed if possible by specific agglutination test and bacteriological examinations. 2. Isolation: In fly-proof quarters until 2 successive negative cultures of stool and urine (collected not less than 24 hours apart) are obtained.	1. Quarantine: None. 2. Immunization: Yes, of ship's personnel with 0.1 cc. "booster dose" of triple typhoid vaccine intracutaneously.	1. Concurrent disinfection: Disinfection of all bowel and urinary discharges and articles soiled with them. 2. Terminal disinfection: Cleaning. 3. Investigate water, milk, shellfish, and food supply.
Typhus fever	1. Recognition by clinical manifestations confirmed if possible by a Weil-Felix reaction in the second week. 2. Isolation: In vermin-free quarters until the temperature has become normal and an additional 36 hours has elapsed (attendants should wear louseproof clothing).	1. Quarantine: In the presence of lice, exposed susceptibles should be quarantined for 14 days after last exposure. 2. Observation: In the absence of lice, exposed susceptibles should not be quarantined but observed daily for 14 days after last exposure. 3. Immunization: Reinoculation of ship's personnel with 1 cc. typhus vaccine subcutaneously.	1. Concurrent disinfection: Destroy all lice and louse eggs on the clothing or in the hair of the patient. 2. Terminal disinfection: None. 3. Check methods for controlling lice, fleas and rats.

SPECIFIC MEASURES FOR DISEASE PREVENTION ON BOARD SHIP—Continued.

Diseases (in alphabetic order)	Measures Applicable to Patient	Measures Applicable to Contacts	Measures Applicable to Patients' Discharges and to Environment
Undulant fever	1. Recognition by clinical manifestations supplemented by agglutination tests and bacteriological examinations, if possible, of the blood and urine for *Brucella*.	1. Quarantine: None.	1. Concurrent disinfection: Disinfection of urine and articles contaminated by urine.
	2. Isolation: None.	2. Immunization: None.	2. Terminal disinfection: None. 3. Search for *Brucella* infection in goats, swine, or cattle. 4. Check on pasteurization of milk.
Whooping cough	1. Recognition by clinical manifestations supported by a differential leukocyte count showing a definite lymphocytosis.	1. Quarantine: None.	1. Concurrent disinfection: Discharges from the nose and throat and articles soiled therewith.
	2. Isolation: Yes; for period of 3 weeks from onset of paroxysmal coughing.	2. All contacts instructed to report promptly to sick bay if they have any cough or cold within 16 days after last date contact. 3. Immunization: Not advised.	2. Terminal disinfection: Thorough cleaning.
Yaws (frambesia)	1. Recognition by clinical manifestations supplemented by serological tests if possible.	1. Quarantine: None.	1. Concurrent disinfection: Disinfection of all soiled dressings and linens.
	2. Isolation: Yes; in flyproof quarters, as long as there are open lesions or moist discharges.	2. All contacts who have open wounds should be instructed to report promptly any unusual development in or about their wound to their medical officer.	2. Terminal disinfection: None.
	3. Treatment as for early syphilis should reduce communicability.	3. Immunization: None.	3. Check fly control measures.
Yellow fever	1. Recognition by clinical manifestations.	1. Immunization: Reinoculate ship's personnel with 0.5 cc. of a 1:10 dilution of a concentrated vaccine subcutaneously.	1. Concurrent disinfection: None.
	2. Isolation: Yes; in screened quarters (from which all mosquitoes have been eliminated by fumigation, trapping, etc.) for the first 4 days of rever.	2. Quarantine: All those probably exposed, in quarters protected with 18-mesh screen for 10 days and inspect daily.	2. Terminal disinfection: None except to destroy any mosquitoes in the patient's quarters.

IMMUNIZATION MEASURES USED IN NAVY

Biologic	Method of Administration	Expected Immunity and Repeat Indications	Comments
Cholera Vaccine—suspension of 8,000 million killed cholera vibrios per cc.	Two subcutaneous injections at 7- to 10-day interval consisting of 0.5 cc. and 1 cc. doses of vaccine respectively.	Apparently short duration of immunity. Stimulating dose of 1 cc. given every 4 to 6 months following initial vaccination as long as danger of infection exists.	No severe reactions have been reported. Given only to personnel in or traveling to areas where there is danger of endemic or epidemic cholera. Should, where practical, be given one month prior to entering area.
Smallpox Vaccine—cowpox virus plain, glycerinated.	Multiple pressure (needle held parallel to skin) 6 to 12 strokes in ⅛-inch area preferably on arm deltoid region. No dressings used. Expose lesion to air.	To be administered on enlistment. Revaccination upon reenlistment or when doubt as to existing protection. Revaccinate whenever exposed and at intervals no greater than four years.	Vaccination reactions: *A. Immune reaction.*—Usually no vesicle. Maximum diameter of erythema reached and passed in 8 to 72 hours. Occurs in fully protected individual. *B. Accelerated reaction.*—Means partial loss of protection gained from a previous vaccination or attack. Maximum erythema diameter reached in 3 to 7 days. Usually a vesicle. *C. Primary reaction.*—Observed in unprotected individuals and previous unsuccessful vaccinations. Maximum erythema reached in 8 to 14 days. Always a vesicle.
Tetanus Toxoid—alum precipitated.	Two 0.5 cc. injections intramuscularly with interval not less than 4 or more than 8 weeks.	One year after initial immunization give a single booster injection of 0.5 cc. of alum precipitated tetanus toxoid intramuscularly. Further booster of 0.5 cc. when going into combat zone irrespective of time interval since previous injection. Should be given at least one month before entering combat zone. Upon being wounded or exposed to tetanus infection a further 0.5 cc. dose of toxoid is given irrespective of the time interval since previous injection.	Tetanus toxoid may be given concurrently with typhoid and smallpox. It is considered unnecessary to repeat the annual "booster."
Triple (typhoid-paratyphoid) Vaccine—1,000 million bacteria (typhoid) per cc.; 250 million each of paratyphoid "A" and "B" organisms.	Subcutaneously 3 injections of 0.5 cc., 1 cc. and 1 cc at weekly intervals. This is considered the standard course.	Intracutaneous injection of 0.1 cc. triple (typhoid - paratyphoid A and B) vaccine annually as a booster dose after the standard course has been received.	Tuberculin syringe should be used for the "booster" injection.

IMMUNIZATION MEASURES USED IN NAVY—Continued.

Biologic	Method of Administration	Expected Immunity and Repeat Indications	Comments
Typhus fever Vaccine—a suspension killed epidemic typhus Rickettsiae prepared by Cox yolk-sac culture method.	Three subcutaneous injections of 1 cc. each at intervals of 7 to 10 days.	Stimulating dose of 1 cc. subcutaneously given every 4 to 6 months following initial vaccination as long as there is danger of epidemic typhus fever.	No severe reactions have been reported. Given to all personnel on active duty in areas where danger from epidemic typhus fever exists.
Yellow fever Vaccine—strain of living yellow fever virus attenuated through prolonged cultivation in tissue cultures (chick embryo).	0.5 cc. of 1:10 dilution of concentrated vaccine subcutaneously (one dose only).	All personnel routinely immunized. Immunization is lifelong but in presence of an epidemic of yellow fever another dose shall be given to increase the titer of immune bodies.	Vaccine must be kept at temperature not above 4° C. (39° F.). All diluted vaccine which remains unused after 3 hours must be discarded. Use only diluted vaccine. A very mild febrile reaction may occur in 4 to 7 days. Yellow fever vaccine should *not* be given concurrently with smallpox. Give yellow fever vaccine first and at least 5 days later give smallpox. Yellow fever vaccine may be given with typhoid or tetanus.

It has been suggested that personnel in extreme northern latitudes be given shots of antidiphtheria toxoid due to the fact that unimmunized persons are extremely susceptible to diphtheria the farther north they travel. This suggestion is under consideration by the Navy but is not yet a part of its immunization schedule.

CHAPTER 13

FUNDAMENTALS OF AVIATION MEDICINE

Naval aviation medicine practice as it relates to naval flying personnel deals principally with the physical maintenance of officers and men subject to the hazards and physical stresses inherent in their occupation and peculiar to the environment of flying.

Man is by nature a terrestrial animal and whenever he ventures to ascend into the atmospheric envelope surrounding the earth, he finds himself in an environment unfavorable to the carrying on of his normal physiological functions. In the case of the aviator, physiological adjustments must be made to rapidly changing barometric pressures and to extreme ranges of temperature.

Changes in barometric pressure do not alter the composition of the air he breathes, but do alter partial pressures of its constituent gases, and hence the availability of oxygen, and oxygen in sufficient amount is required for all cell life. Above 5,000 feet altitude anoxia begins.

The composition of atmospheric air is:

Oxygen	21 percent	By volume.
Nitrogen	78 percent	
Rare (inert) gases	1 percent	

This is uniform up to an altitude of 70,000 feet. At sea level, air exerts a pressure (weight) of 760 mm. of mercury. Twenty-one percent of this pressure is exerted by oxygen.

Atmospheric pressure (sea level)	=760 mm. Hg.
Partial pressure (oxygen)	=159 mm. Hg.
Atmospheric pressure (10,000 feet)	=506 mm. Hg.
Partial pressure (oxygen)	=105 mm. Hg.
Atmospheric pressure (18,000 feet)	=380 mm. Hg.
Partial pressure (oxygen)	=79.5 mm. Hg.
Atmospheric pressure (28,000 feet)	=253 mm. Hg.
Partial pressure (oxygen)	=53 mm. Hg.

The above partial pressure exist only in dry air. They do not exist in the lungs.

	Dry air	*Lungs*
Oxygen	160 mm. Hg.	100 mm. Hg.
Nitrogen	600 mm. Hg.	570 mm. Hg.
Carbon dioxide	Trace	43 mm. Hg.
Water vapor	None	47 mm. Hg.
	760	760

The partial pressures of water vapor and of carbon dioxide remain constant at altitudes considered so far. Regardless of partial pressure of oxygen available in inhaled air, the partial pressures of both carbon dioxide and water vapor must be subtracted in figuring partial pressure of oxygen available to the lungs. Carbon dioxide exists in alveolar sacs in 4 to 6 percent volume and exerts a constant pressure of from 36 to 40 mm. of mercury. Water vapor remains constant at 47 mm.

Increase of altitude (decrease of atmospheric pressure) requires the following considerations:

1. Altitude sickness due to lack of oxygen (anoxia).
2. Effects due to decreased pressures:

a. Decompression sickness ("bends" or "aeroembolism").

b. Expansion of gases in middle ear and sinuses.

c. Oxygen indoctrination and classification.

d. Oxygen apparatus.

3. Effects of temperature.

Contributory stresses in flying are:

1. Blackout — effects of high centrifugal forces due to sudden changes in direction of the plane.
2. Carbon-monoxide intoxication due to exhaust gases from engines or machine guns.
3. The special organs in flying.
4. Conflicting visual and equilibratory stimuli causing *vertigo*, sometimes extreme in degree.

5. Unusual motion of plane due to bumpiness and maneuvers causing *motion sickness.*

6. Flying fatigue, which is due probably to a summation of all the above stresses plus long hours of intense concentration, working or sitting in constricted spaces, and the continual awareness of hazard.

Aviation hygiene, therefore, must concern itself with these hazards and stresses, their prophylaxis and prevention or amelioration.

Anoxemia (anoxia) arises from a lack of oxygen in the inspired air. The brain is affected before other tissues, with resultant defective judgment, lack of self-criticism, inaccuracy, euphoria, dimming of alertness and impairment of mental processes. Visual acuity is reduced with severe anoxia, and at night the ability to discern dimly illuminated objects is impaired with any degree of oxygen lack. Sensation of weakness in the legs and arms, unsteady gait, inability to coordinate movements, and finally uncontrollable tremors and twitchings develop with progressive anoxia. This may end in convulsive seizures or simple coma. Lack of oxygen makes the hands and feet cold and may dispose of airsickness. Dizziness, rapid beating of the heart and alternating rapid and slower respirations are frequently seen. The mental changes in the earlier stages are not appreciated by the individual and may prove fatal.

Never risk being short of oxygen under war conditions!

Oxygen should be used as follows:

1. All flights above 10,000 feet of more than 4 hours' duration.

2. All flights above 12,000 feet of more than 2 hours' duration.

3. All flights above 15,000 feet regardless of the duration.

4. All flights above 23,000 feet at a rapid rate of climb. Undiluted oxygen from the ground up.

5. Pilots are urged to use oxygen equipment whenever practicable, even at low altitudes, in the interests of familiarization and increased efficiency.

At ambient temperature and pressure, gases are in solution in the blood in proportion to their respective absorption coefficients and partial pressures. With slow ascents gases have time to diffuse out through the lungs; but where the ascent is rapid, to great heights and diminished pressure, gases will come out of the blood with the formation of bubbles in vessels and tissues. Considerable variation in susceptibility is noted among flying personnel. In general, slim, physically fit and young individuals appear the least susceptible. Prevention at present consists of classification of personnel for altitude tolerance by low-pressure chamber tests.

Characteristic symptoms of aero-embolism:

1. Itching and paresthesias of the skin.

2. Pain in the limbs (muscles and joints) especially in the shoulders and knees. Pain may be mild and relieved by rubbing or movement, or it may become progressively more severe, and even lead to collapse.

3. Abdominal discomfort may be severe from gaseous distention.

4. A vaguely defined generalized discomfort associated with sweating, chilliness and dizziness which may progress to pallor and sudden collapse.

5. Pain behind the sternum and coughing (chokes) occur with less frequency.

All symptoms tend to disappear rapidly when personnel are brought down to the 20,000-25,000 foot levels. Initial symptoms rarely occur below 30,000 feet altitude pressure.

All flying personnel under training should be instructed in the use and functioning of current types of oxygen-breathing equipment and supply.

The program of indoctrination should consist briefly of the following:

1. Lectures on atmospheric physics.

2. Demonstration of oxygen supply in low-pressure chamber, proper fitting of oxygen masks and adjustment of service type apparatus.

3. Chamber run:

a. To 18,000 feet without oxygen for 20 minutes. After 15 minutes at this level, a simple pencil and paper code test is given and subjects are asked to write a brief statement describing how they feel.

b. Oxygen masks are adjusted and ascent made to 28,000 feet at the rate of 5,000 feet per minute. Subjects are held at this level for 30 minutes.

c. Descent at rate of 5,000 feet per minute.

d. Subjects are taught how to clear the eustachian tubes to equalize pressure in the ears, and are impressed with the necessity for slow, regular, normal breathing.

4. Lectures should be given in the chamber by a loud-speaker system during ascents and during stays at the prescribed levels for the purpose of demonstrating the effects of anoxia and the maintenance of efficiency while using oxygen. Lectures can be supplemented by training films, during classroom lecture periods.

N. B.—At 25,000 feet individuals last only a few minutes without oxygen; at 20,000 feet from 10 to 20 minutes; at 18,000 feet from 45 to 75 minutes; at 15,000 feet an estimated 5 or 6 hours; at 10,000 feet some pilots can last all day, though with severe after-symptoms of chronic oxygen starvation.

OXYGEN BREATHING APPARATUS

Rebreather equipment.—Figure 32 illustrates diagrammatically the component parts and functioning of the M. S. A. individual oxygen supply type of rebreather.

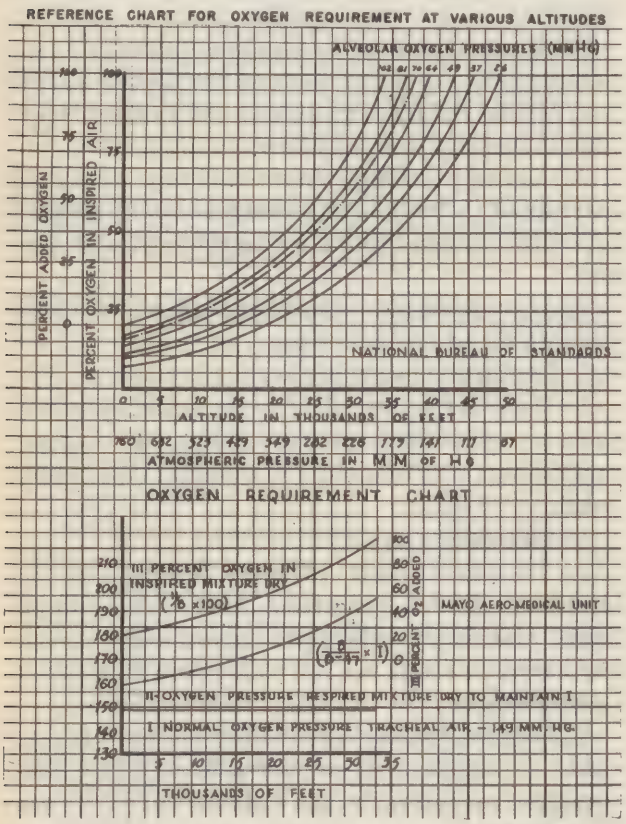
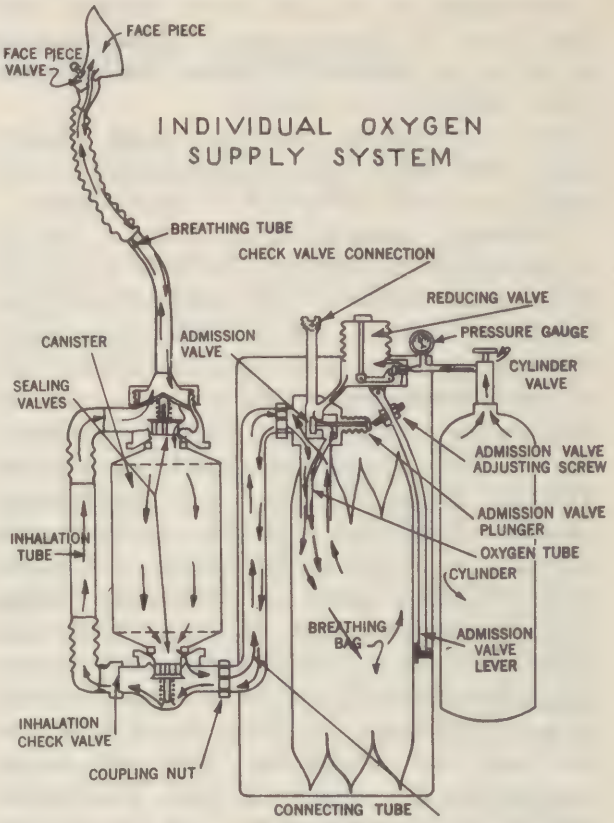


Figure 31.—Reference chart for oxygen requirement at various altitudes.

Figure 33 diagrammatically illustrates the component parts and functioning of the M. S. A. central oxygen supply type of rebreather.



FLOW DIAGRAM

Figure 32.

Figure 34 illustrates the component parts and method of installation of the central oxygen supply type of rebreather in two-place aircraft.

Demand equipment.—Figure 35 illustrates the component parts and functioning of the M. S. A. demand oxygen supply equipment.

Detailed instructions regarding the installation and operation of both rebreather and demand types of equipment are contained in a manual supplied by the manufacturer.

TEMPERATURE.—With ascent, the temperature falls approximately 2° C. for every 1,000 feet until 35,000 feet is reached. Then it remains nearly constant at —55° C. Local variations of temperature do occur.

Protection against cold.—The temperature of the body is maintained by a balance between

the heat produced by muscular activity and the heat lost from the skin by conduction, convection and evaporation of sweat, and moisture lost from the lungs. Factors affecting the heat lost from the skin are temperature of the air, wind, and moisture in the air.

The effects of cold on personnel may be briefly stated to be discomfort, *marked loss of efficiency* due to gradual numbing of physical and mental activity. In the case of severe and prolonged cold, this terminates in an uncontrollable desire to go to sleep.

Local intense cold may cause frostbite. Cold may produce spasms of the small arteries leading to reduction of the blood flow and pain. The blood flow may fall below that necessary to keep the tissues alive, especially where there is a concurrent lack of oxygen. When vessel

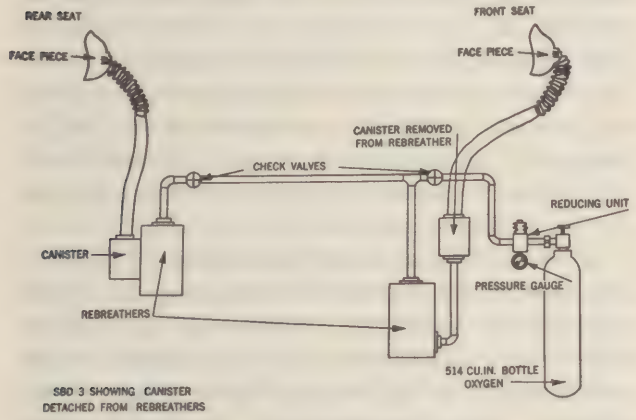


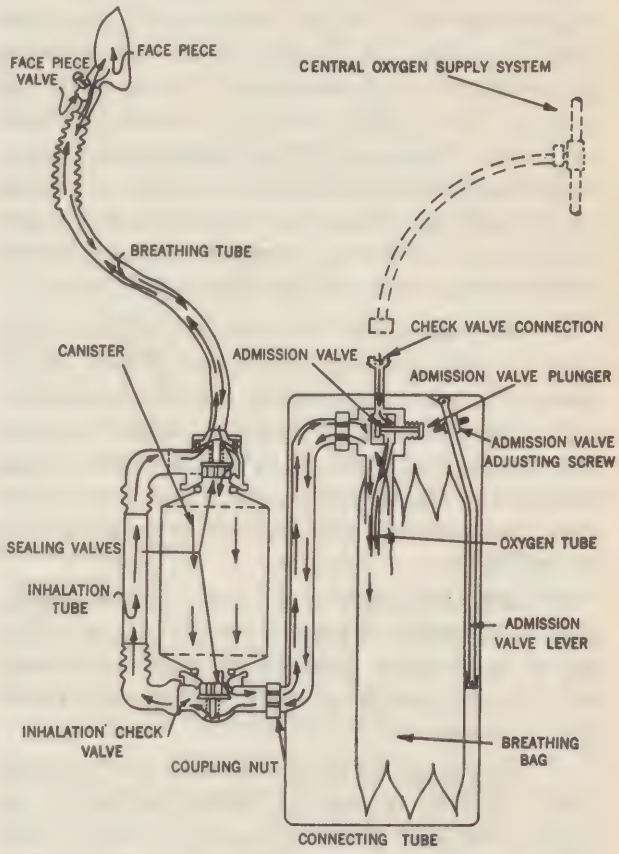
Figure 33.

walls are damaged through oxygen lack, serum passes into the tissues and the part becomes swollen, blue, and may have blister formation. This may lead to tissue destruction (ulceration and gangrene).

The imminence of frostbite is indicated when the part feels cold. This is usually followed by pain and finally by the loss of sensation (numbness).

Various protective and preventive measures may be adopted to increase the comfort and thereby the efficiency of personnel:

1. Much progress has been made in providing closed aircraft free from draughts, insulated against cold, and with heating arrangement. In general the bow, dorsal turret, belly turret and tail turret are the locations in which subjective cold is most apt to be complained of in larger aircraft. Pilots, co-pilots and radio operators are affected to a lesser degree. There is little evidence that fighter pilots suffer to any degree, and the incidence of frostbite in this group is low.



FLOW DIAGRAM

Figure 34.

2. Clothing (see chapter 7).

a. Flying clothing should be windproof, made of material that will absorb moisture from the skin, and that will contain as much air as possible. Efficient flying clothing takes into consideration the fact that stationary dry air is a poor conductor of heat and that application of this fact can be brought about by the use of multiple layers or by furs.

b. Clothing should be loose fitting, especially socks and gloves; otherwise tightness impairs circulation and predisposes to frostbite. Gloves are particularly important to gunners, since some of their tasks require considerable manual dexterity and sense of touch, i. e., reloading guns and ammunition, or changing the bulb

in the reflector sight. Silk gloves may be used if such work is not too prolonged.

c. The importance of dry clothing cannot be overstated. Moist clothing will not only conduct the heat away from the skin readily, but may freeze and become hard and uncomfortable. The body constantly gives off moisture in the form of perspiration; hence it is important that flying clothing should be worn only while flying, and that adequate arrangements should be made for thorough drying after wearing. Personnel should not be permitted to spend long periods standing by in ready rooms wearing full flight equipment.

d. The hands and feet should be thoroughly dried before donning socks and gloves. Moist, clammy hands and feet are rapidly affected by cold. The use of ointments to protect against frostbite is not advised. They do afford some protection against heat loss, but are messy, spoil the clothes, and prevent the absorption of moisture.

e. Lack of oxygen is a factor in the production of frostbite. The early symptom is a feeling of cold in the hands and feet; accordingly it is wise always to take oxygen at 10,000 feet or above.

f. The personnel should always be furnished with a hot meal and hot drinks before a long flight. Frequent small amounts of sugary foods and drinks help ward off effects of cold and promote maximum efficiency.

Prevention entails the above-noted precautions; in addition, air crews should wear two pairs of gloves (inner pair silk) and keep numb parts moving. It is reemphasized that *personnel should have thoroughly dry, warm socks and gloves, and dry hands and feet before taking off in operational work exposing them to cold.*

Treatment of frostbite.

1. Do not put part near any heat.
2. Restore circulation by *gentle* rubbing. (Do not rub with snow.)
3. Give extra oxygen at ground level.
4. If severe:

a. Elevelate the part to avoid venous congestion and to put at rest.

b. Aseptic dressings *loosely* bandaged.

c. Use oxygen. (Suggested 8 liters per minute for 1 hour every 2 hours.)

5. Never use vigorous massage or rubbing. Such treatment further damages the part and is dangerous.

Acceleration—blackout.—The most severe effects of linear acceleration are experienced under the following conditions:

1. Catapult shots.
2. Crashes or crash landings.
3. Rapid deceleration caused by engaging arresting gear in carrier landings.

These forces act on the pilot in one direction, and in the catapult and carrier landings are of the order of from 2 to 4 G (centrifugal force) acting through 2 to 3 seconds. These forces do not cause any great physiological disturbance because they occur in the transverse axis of the body and have little effect on the column of circulating blood. Where crashes through the barriers erected on carriers occur, the forces exerted on the plane and pilot probably do not in most cases exceed 10 to 12 G. If occupants of planes have proper belt and shoulder harness support, injuries to head and face are in a degree prevented.

In the action of centrifugal force on aircraft and pilots, any aircraft flying along any curve of a circle, whether produced by pulling out of a dive, a tight turn, a diving spiral or any combination of fighter aerobatics, has acting upon it from the center of the circle a centrifugal acceleration which varies directly as the square of the linear velocity and inversely as the radius of the circle. Weight is a force, and is expressed as the product of mass times acceleration due to gravity. Hence when a pilot has acting upon him an acceleration of several times that of gravity, his weight increases in the same proportion. At a centrifugal acceleration of 6 G, a pilot weighing normally 150 pounds would weigh 900 pounds.

The production of blackout is caused by centrifugal forces acting in the direction of the long axis of the body. If these forces are large (over 3.5 G), they are capable of causing pooling or accumulation of the circulating blood in the veins and capillary beds of dependent portions of the body, particularly in the vascular beds of the upper and lower extremities. This acts to prevent sufficient return flow by

the venous system to permit adequate filling of the heart chambers. Hydrostatic pressures of the blood column ascending to supply the brain, retinal membrane of the eye, etc., falls to a level at which adequate blood supply to these structures can no longer be maintained. This is due to:

1. Direct effect of G on the column of blood from the left ventricle to the head.

2. Inefficiency of the heart as a pumping mechanism due to pooling of blood in the extremities, with resultant inadequate venous return flow to the heart.

When the effects of these circulatory changes reach a given value for the individual pilot, failure of vision or "blackout" occurs. The time taken to reach this point is a function of the individual's physiological mechanism. (A pilot may not blackout when pulling out of a dive if 6 G be applied for 1 second; but would blackout in a tight turn in which 6 G was maintained for 5 seconds.)

For each individual, in order to produce blackout, the minimum centrifugal force exerted for a minimum period of time appears to be 4.5 to 5.0 G acting for 4 seconds.

Unconsciousness is more readily induced by tight and inefficient abdominal belts, by compression of the veins of the neck in a mistaken effort to obstruct the drainage of blood from the brain, by severe degrees of anoxia, and by the after-effects of illness, alcohol or nicotine poisoning. Consciousness returns when the centrifugal force (G) is removed, but the pilot may still have visual loss for 1 to 2 seconds, and may still be markedly confused, with some loss of orientation in space. The best means at present available for the prevention of blackout from high acceleration have been adopted by foreign nations, i. e., Great Britain and Germany. The method essentially consists of the assumption by the pilot of a crouching position which reduces the height of the blood column between the brain and the heart. At the same time the legs are raised as far as possible by auxiliary rudder pedals which elevate the feet about 6 inches, thereby decreasing the venous level between the legs and heart. Assumption of this attitude causes tensing of the abdominal muscles, which can be further accentuated by shouting or straining to increase intra-abdominal pressure and help to prevent pooling of blood in abdominal organs.

All flying personnel should keep physically fit, practice exercises to increase abdominal muscular tone, avoid excesses in the use of alcohol and tobacco and refrain from aerobatics until an hour after a meal. Experience has indicated that a full stomach lowers resistance to blackout.

Mechanical equipment designed to assist the venous return flow to the heart has been under study for a considerable period of time. This procedure shows some promise of allowing pilots to withstand higher G values without blackout while in the normally assumed posture in the cockpit.

TOXIC GASES.—Carbon monoxide is considered the most dangerous of all the gases likely to be encountered in aircraft. In flight, the air stream along the fuselage often produces decreased pressures within so that gases tend to be sucked in. An aircraft engine gives off about 34 cubic feet of exhaust gas per second with high carbonmonoxide content, and it should be remembered that higher concentrations are produced when engines are cold and when there is incomplete combustion operating at altitudes. The known affinity of hemoglobin for carbon monoxide and the resulting stable compound carbon monoxide-hemoglobin seriously lowers the ceiling of personnel even though the percentages of carbon monoxide breathed may appear relatively small. As an example, at 12,000 feet blood oxygen saturation is about 85 percent; breathing 0.02 percent carbon monoxide for an hour reduces oxygen saturation to 77 percent and in four hours to 65 percent. Such a decrease in oxygen saturation may lead to severe altitude sickness at this level. This danger is lessened but not entirely eliminated while wearing oxygen masks. Up to 20,000 feet there is danger of carbon-monoxide absorption, particularly in those systems using air diluter demand.

Permissible levels of carbon monoxide in aircraft are:

	Percent
United States (Navy specification)	1.01
British	.005
German	.0025

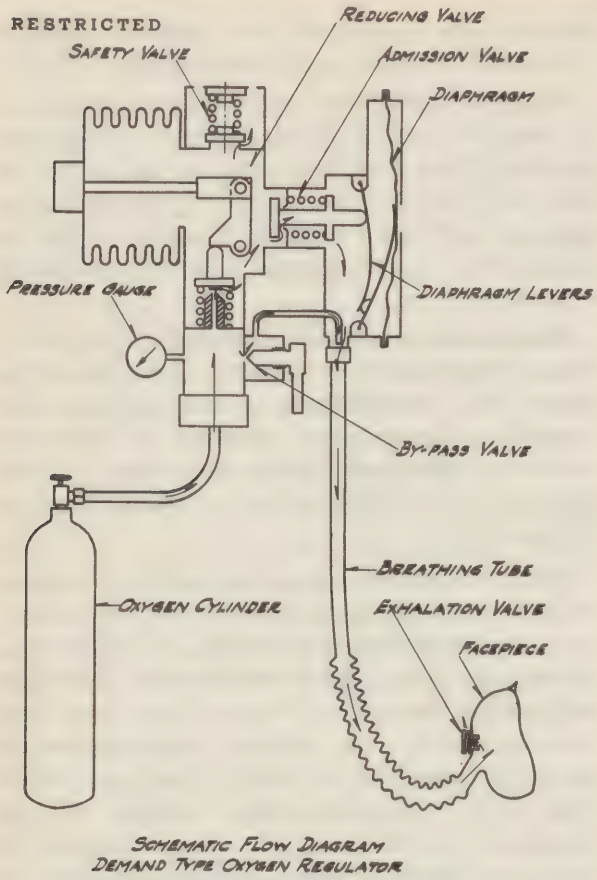


Figure 35.—Schematic flow diagram demand type oxygen regulator.

The symptoms shown in figure 36 are exaggerated with altitude because of lowered oxygen partial pressures.

Oil vapors from the engines may produce nausea and gastric irritation. Potentially, the lead content in exhaust gas may cause lead poisoning, but the danger is negligible compared with the effects and dangers of carbon monoxide.

THE SPECIAL SENSE ORGAN IN FLIGHT.—The most important of the special sense organs for flying personnel is the eye. Good vision is essential to recognition of objectives from great heights, recognition of opponents in the air at a distance, and in the estimation of the possibility of landing on unprepared fields. While flying in sight of the earth, use of the eyes allows correct orientation in space, and while blind flying observation of instruments gives correct objective estimation of the position in the air, the ability to make good landings depends, in part, on ocular muscle balance which can be disturbed temporarily by fatigue or illness. Color perception is essential as long as navigation lights are red and green. Color defectives show diminished perception when fatigued or when anoxic, and under decreased illumination.

Symptoms

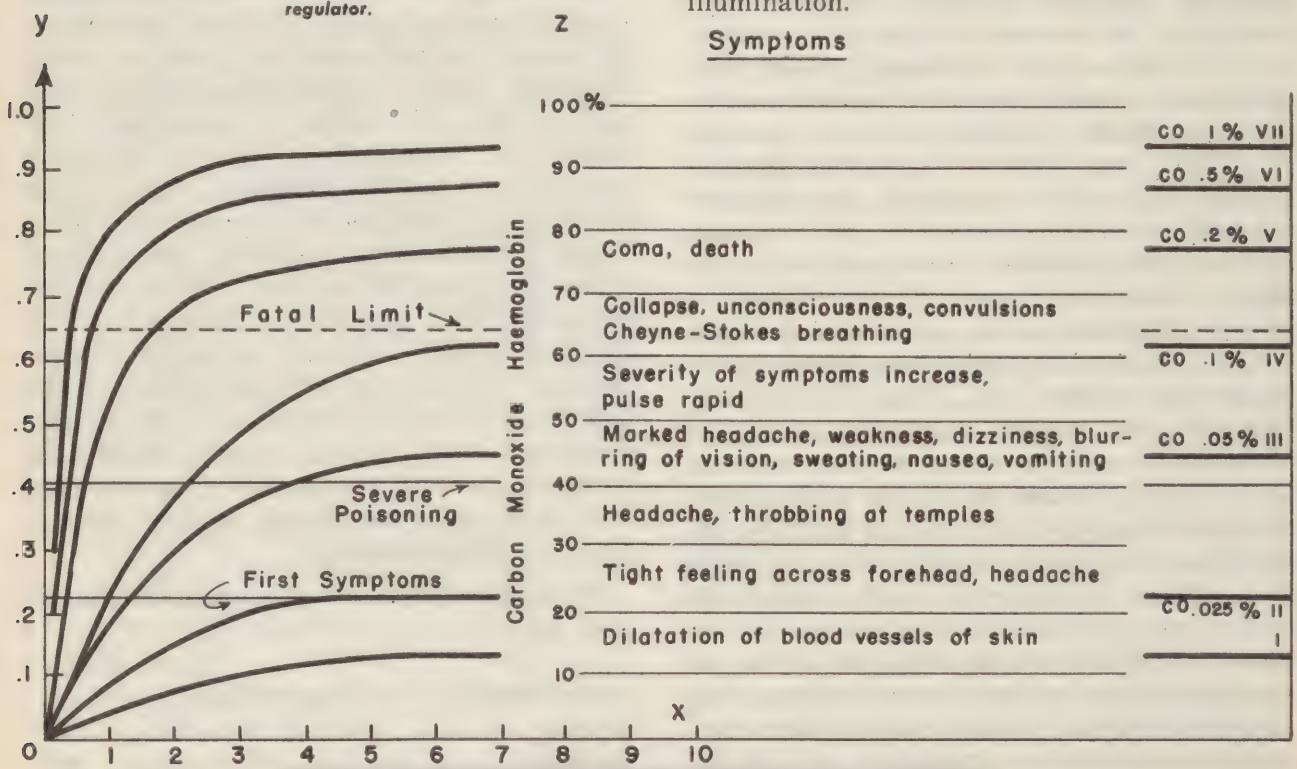


Figure 36.—Symptoms accompanying varying carbon monoxide levels.

NIGHT VISION.—One of the most important functions of the eye in wartime is the ability to *see* at night. The cones are primarily concerned with day vision, while the rods, on the other hand, are concerned largely with seeing under dim illumination.

This function is brought into play by retinal adaptive process which in the main consists of a chemical change occurring in the rods increasing their sensitivity. Ordinarily this change requires about 30 minutes in complete darkness until the rods reach near maximum sensitivity. The rods are most sensitive at about 510 millimicrons, i. e., to light which appears blue-green to the cones; however, they are relatively insensitive to waves longer than 600 millimicrons. At this point the cones see red and the rods are in the dark up to certain intensities of illumination. Taking advantage of this latter fact, goggles are used which transmit light at the 600-millimicron level and permit visual tasks to be carried out, while at the same time allowing the rods to become almost completely dark adapted (3 to 6 minutes for complete adaptation).

The subject is of such importance that the fundamental rules which aid in securing maximal night visual efficiency are quoted:

1. Do not attempt night duties until dark adapted—avoid short cuts.
2. Maintain maximum dark adaptation by avoiding all possible light, except red light of low intensity.
3. For instrument lighting use dim red light, and do not stare at lighted instruments.
4. Keep windshield and goggles spotless and unscratched.
5. Practice using the *corners of the eyes*—night targets are better seen by not looking directly at them.
6. Move the eyes frequently; practice systematic scanning; be alert for moving objects.
7. Know the tactical value of low light contrast in night missions.
8. Use night binoculars when possible.
9. Observe technical orders in use of oxygen—be overconscientious at night, not overconfident.
10. Don't *break training*, the stakes are too high.
11. Learn location of instruments and controls in aircraft by sense of touch. This blindfold drill will pay dividends.

GLARE AND USE OF GOGGLES.—The use of goggles is important in maintaining the efficiency of flying personnel, particularly when used to reduce glare, to protect the eyes from irritation by draughts and dust, and to prevent fire or flash injuries. Glare coming from the sun, reflected from water or clouds or from searchlights, induces ocular fatigue and markedly impairs efficiency. Tinted lenses in goggles or spectacles are of great help in reducing glare. The wearing of polarized lenses is not advised, since high velocity air pressure sets up invisible lines of stress in plastics used in windshield which become visible and disturbing when viewed through such lenses.

EFFECTS OF ALTITUDE ON EARS AND SINUSES.—Changes in pressure set up differentials between the middle ear and the external atmosphere which are equalized normally by way of the eustachian tube. With sudden pressure changes, any blockage of this tube, either by mechanical means or inflammatory processes, gives rise to discomfort or severe pain, or even rupture of the tympanum.

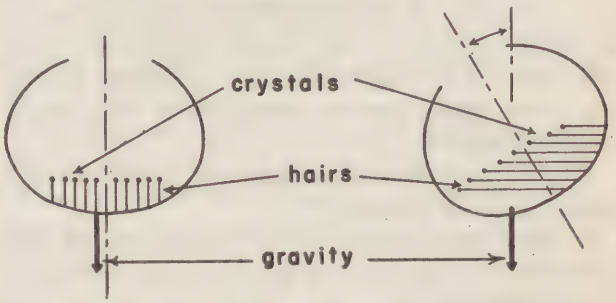


Figure 37.—Diagram to indicate how the static organ in the ear is affected by changes in the position of the head.

Prevention of discomfort or pain can be avoided by:

1. Swallowing repeatedly, yawning, or by pinching the nostrils closed and attempting to blow through the nose.
2. If no relief is obtained, ascent of 1,000 or 2,000 feet and repetition of the methods given above.
3. Flights to altitude and descents should not be attempted by personnel suffering from sore throat, head cold, or catarrh, unless required by operational necessity.

4. Temporary loss of auditory acuity may be noted after descent, but with equilization of pressure, this soon disappears.

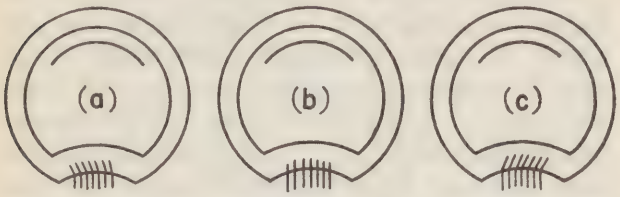


Figure 38.—Diagram to show the action of a semicircular canal.

The frontal and maxillary sinuses may occasion severe discomfort if their ducts become blocked. Pressure within these sinuses usually equalizes readily with that of the outside air unless there is mechanical blockage (fractures), or blockage from acute or chronic inflammation.

The use of a benzedrine inhaler (not more than once in an hour) or of a mild vasoconstrictor nasal spray will do much to prevent symptoms.

EQUILIBRIUM.—Vertigo, defined as "dizziness or swimming of the head, giddiness; a disturbance in which objects, though stationary, appear to move in various directions, and the person affected finds it difficult to maintain correct posture," is of considerable importance to flying personnel. It is vitally important that the physical and psychological reactions resulting from these sensory illusions be recognized and understood.

The organs of equilibrium are located in the inner ear and consist of:

1. The static organs, for perception of the direction of the pull of gravity and probably of acceleration.

2. The semicircular canals for the perception of movements of rotation.

When the force of gravity and centrifugal force come into play during flight, it is the resultant of these two forces which affects the sensory hairs of the static organ. This may deceive the pilot as to his relative position in space during instrument flight.

1. At the commencement of rotation, the fluid lags, the sensory hairs are bent back and the brain senses a turning movement.

2. The rotation continues at the same speed and the fluid is now moving as rapidly as the canals; the sensory hairs are upright and no turning movement is felt, although a turn is being made.

3. The rotation has ceased, but the fluid continues moving in the same direction for a time; the hairs are bent in this direction and the brain senses a false turning movement.

Man, with his eyes closed, has no means of sensing a uniform turning movement; but can only sense acceleration or deceleration of the movement. It is therefore possible to rotate a person slowly without his being aware of it.

The organs of equilibrium are closely connected to the eyes by nerve paths. This gives rise to false conceptions in flight due to the fact that the ear organs react to the resultant of gravitational and centrifugal forces, while the eyes react to what they see as well as to nerve impulses from the ear. Consequently, it frequently happens, in flying, that sensations sent by the ear are in opposition to those sent by the eyes and to those sensibilities located in the skin, muscles, tendons, and joints. These opposed impulses received by the brain, and the confused and contradictory directions sent from the brain to the body are considered to be the chief cause of vertigo.

BLIND FLYING AND SENSORY ILLUSIONS.—The following are some of the sensory illusions which may be noted during instrument flying:

1. During a steep turn centrifugal force may produce a sensation of ascent. (Pilot's reaction—push controls forward.)

2. Returning to level flight from a steep turn, the removal of the strain of centrifugal force from the body leads to a feeling of less than normal weight and a sensation that the aircraft is falling (Pilot's reaction—pull back on the controls.)

3. Where an aircraft skids in a turn, the sensation is that of a tilt opposed to the direction of the true turn.

4. In instrument flying a false sensation of turning often occurs in straight and level flight. This may be due to:

a. The eyes working in conjunction with the ears and receiving false sensations from the latter.

b. False sensation of rotation produced in the inner ear when motions caused by turbulent air are recorded.

c. Correction of the course for propeller torque by the rudder, which frequently gives a sense of turning.

5. During a sharp turn, movement of the head often leads to the feeling that the aircraft is diving or tipping; and during a spin the sensation of going beyond the vertical. (Pilot reaction—pull back on controls.)

6. Pilots are apparently more subject to vertigo when nervous, tired, or tense. Occurrence among wing men in formation flying is common under conditions of reduced visibility. It is caused possibly by the lack of horizon or plane of reference, or the skidding and maneuvering necessary to maintain position. The most common sensations are of diving, approaching a stall, or flying in some unusual position, and the pilot's reaction is to recover from whatever attitude he feels he may be in, correction usually resulting in a vertical spin or dive, and often a fatal crash.

A good general rule for flying personnel to remember is: "The sensations will deceive, but the instruments tell the truth."

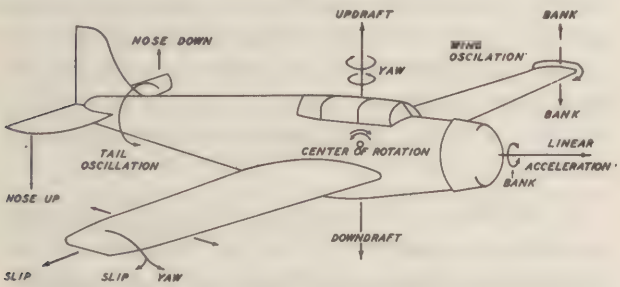


Figure 39.—Direction of accelerations of airplane during level flight.

AIRSICKNESS (MOTION SICKNESS).—Airsickness in personnel is due to an abnormal individual susceptibility to the following factors:

1. Overstimulation of the mechanism of equilibrium with reflex involvement of the vegetative nerve centers of the body.

2. Vertical, rotary, and lateral motion caused by air turbulence and aerodynamic qualities of aircraft.

The primary activating factor in the production of airsickness is vertical linear acceleration, and of lesser importance, the rotary acceleration around the transverse axis of the aircraft.

The factors causing airsickness, in the order of their importance are:

1. Motion.
2. Loss of visual reference.
3. Odors, vibration, and noise.
4. Cold.
5. Fear of anxiety.

The symptoms chiefly affecting personnel are nausea, vomiting, cold perspiration, weakness, dizziness, and, in extreme cases, marked prostration.

These factors are of importance in that they detract considerably from the efficiency of air crews on war missions. Airsickness may be of extreme importance when flights of air-borne troops either in aircraft or gliders are assigned missions requiring maximum efficiency.

Treatment.—Taking into consideration the causative factors, the best treatment is prevention. The use of drugs to prevent airsickness is not recommended. There is considerable evidence that air crews adapt themselves in some measure as flying experience increases. This factor should be stressed.

FLYING FATIGUE.—Flying fatigue is a condition resulting from abnormal strain or stresses being placed upon a normal individual. It is found particularly in members of combat crews engaged in combat missions, and affects pilots and air crews alike.

The characteristics of flying fatigue are various and variable, but in every case there are sufficient signs or symptoms which are likely to be spotted by a good squadron commander or flight surgeon. If the condition is not recognized early, irreparable harm may be done to the individual, and he may be permanently lost as a member of the combat unit. It is of prime importance that there be close liaison between flight and squadron commanders and squadron medical officers in order that early recognition of the condition may be facilitated.

There are stresses peculiar to flying in peacetime which are both physiological and psychological. The former are connected with many conditions including oxygen shortage at altitudes, exposure to cold and fatigue on long flights, and the effects of G involved in certain maneuvers. The psychological strains are those inherent in the pursuit of any duty carrying

with it risks which call for constant care and concentration in their avoidance. In peacetime the majority of personnel adapt themselves satisfactorily to these forms of stress.

In time of war the stresses become enormously increased in both intensity and duration, and the effects become cumulative, owing to *lack of opportunity for adequate recuperation.* Once the individual has reached the limits of his endurance, his deterioration is rapid. Physiological and psychological strains react upon one another to establish a vicious circle, which, if not broken early, will inevitably lead to accident or breakdown. The importance of avoiding wastage of personnel by extra vigilance in watching for signs of deterioration and by the application of appropriate countermeasures is obvious. The development of even minor indications of fatigue or stress should be regarded as a danger signal which warrants close attention and investigation.

The warning signals which are of importance are:

1. *Falling off in flying efficiency.*
2. Markedly increased liability to fatigue, both mental and physical.
3. Loss of interest, disinclination for effort.
4. Increased indulgence in alcohol and/or tobacco.
5. A tendency to become unsociable or irritable.
6. Emotional crises, loss of self control.
7. Physical symptoms such as *loss of appetite, inability to sleep properly* (nightmares frequent), *loss of weight,* the presence of tremors, tachycardia, and typical anxiety facies.

The occurrence of the symptoms may be the only evidence of what may be termed a *preneurotic state* for which a period of rest, leave, or change of duty is indicated.

Prevention is of primary fundamental importance in handling the problem. Briefly outlined below are some of the methods which may be applied in order to avoid personnel wastage.

1. Institution as far as possible of recreational facilities aboard operating stations. This should include aircraft carriers insofar as practicable, the attempt being to provide some degree of relaxation and relief from constant routine.

2. Every effort should be made to provide as great an amount of comfortable sleep as possible for personnel who are required to fly.

3. Leave should be granted freely whenever possible, consistent with operational requirements.

a. For shore-based operational squadrons, a 24-hour leave in each week or after any major operation; at least 8 days every 6 weeks or 14 days leave in any given 3-month period.

b. It is difficult, if not impossible, to stipulate any definite program of leave for carrier-based squadrons. Where possible, personnel should always be granted leave to the fullest extent when the carrier is at anchor. This leave should be clear of the ship and not on the basis of a 1- or 2-hour recall. Such leave on a restricted standby status defeats its own purpose.

4. There is no apparent necessity to set arbitrary operational flying limits for personnel. However, foreign experience has indicated that signs of incipient fatigue among personnel are first noted around 100-125 hours for fighter personnel and 125-150 hours for bomber personnel. Patrol personnel average about 250-300 hours. The above noted hours refer to combat operational flying only. These limits should not be set up arbitrarily as limits for pilot or aircrew efficiency, but rather as a guide to medical officers in their estimations of peak personnel efficiency.

5. Handling of cases of incipient fatigue: prevention should be as far as possible an administrative problem effected by close cooperation between commanding officers and medical officers. The following factors should be considered:

a. Placing individuals (with incipient fatigue or stress) on the sick list has a deleterious effect upon individual and squadron morale.

b. Hospitalization under medical care reacts unfavorably as far as the restoration of the individual to peak operational efficiency is concerned.

c. It is unwise to mix cases of incipient fatigue (those presenting more or less intangible evidence of staleness — war weariness) and those cases which have developed well-marked symptomatology with predominant psychogenic aspects. Intermingling the two has a distinctly unfavorable reaction on the incipient cases in-

dicated by a gradual loss of "edge" and desire to return to a full operational status.

d. Rehabilitation should be chiefly recreational or by a change of duty status, either to nonflying duties or by transfer to flying training activities.

e. Do not whip a "tired horse" with drugs. Such a procedure is physiologically unsound and leads to eventual exaggeration of the condition.

Fatigue in high altitude flying.—Flights over 25,000 feet, and especially over 30,000 feet, often produce an exhaustion out of proportion to the duration of the flight or the effort involved. This fatigue appears to be much greater than that experienced in flights of 20,000 feet or below, irrespective of whether the mission involves combat or patrol.

The condition manifests itself in the following manner:

1. A brief period of exhilaration.
2. Loss of interest in surroundings.
3. Feeling of exhaustion. This fatigue tends to be progressive with repeated exposure. Flying efficiency is diminished. Physical findings show little except a slight to moderate diminution of red cell count and hemoglobin.

When pilots or air crews exhibit the signs of fatigue accompanying high altitude flights, they should be granted a short period of leave (6 to 10 days). This will usually restore them to full operational efficiency.

AIRCRAFT ACCIDENTS.—Advances in military aviation have contributed more to performance and design than to safety factors of aircraft. With this increase in the requirements from the human, there has arisen a correspondingly greater number of accidents which are attributed to personnel failure.

A number of factors may enter into the causes of aviation accidents. Chief of these are:

1. Technical failure (structural, power plant).
2. Personnel failure (pilot error, carelessness, negligence).
3. Weather and terrain (low visibility, storms, icing, rough landing spaces).

By far the greater number of accidents are attributed to personnel failure. The factors contributing to this are briefly outlined below.

1. Anoxia:

a. Failure of oxygen apparatus due to cold, faulty mechanism.

b. Faulty functioning due to unfamiliarity with apparatus or lack of knowledge concerning the effects of altitude.

c. Anoxia due to carbon-monoxide poisoning. (This may be due to technical deficiency of the aircraft or personnel carelessness.)

2. The accentuation of disease or constitutional defects under conditions of high altitude flying (flying following an illness). Also of importance is continued flying by *stale* or *fatigued* personnel. These latter factors lead to gross errors of judgment and diminished efficiency.

3. Effects of acceleration: blackout, particularly in low level dive bombing or in torpedo plane attack may be a fruitful source of accidents with serious injury or fatal termination.

4. Training in all phases of flying and in physiological factors producing reactions in air crews is most important in the prevention of accidents. From the medical standpoint, physiological factors in particular should be stressed. It is insufficient to give preliminary lectures and instruction to personnel while in the training phase only. Indoctrination and instruction should be carried out without interruption in operational units.

Safety appliances.—Apparently it is not possible to avoid injury in those crashes in which the aircraft is completely destroyed, demolished or burned. However, there are a number of accidents in which structural peculiarities or failure to use safety devices contribute to injury. Personnel should be thoroughly indoctrinated in the wisdom of using the shoulder harness, and where that is not available, the thigh straps.

INDUSTRIAL HAZARDS.—There are numerous toxic substances to which ground personnel may be subjected.

Chief among these are airplane dopes, cleaning materials, aviation gasoline, fire-extinguishing compounds, engine exhaust gases, and oil fumes.

Airplane dope.—The hazards from doping are well controlled and personnel engaged in

this type of work should suffer no ill consequences if existing regulations are carried out. From a preventive standpoint, attention to ventilation of workrooms, careful personal hygiene, protective clothing, adequate fresh air and sunshine, careful fire precautions and monthly medical checkups are the most important factors.

The chief danger from *cleaning materials* is from caustic burns or from fire. Carbon tetrachloride is a possible exception. The fumes and liquid of this compound are toxic, and if allowed to come in contact with heated metal, phosgene is formed. Preventive precautions should include the avoidance of breathing vapors or spilling liquid on clothing, keeping material in closed containers, and good ventilation.

Aviation gasoline contains tetraetheyl lead, a toxic compound. Precautions should include avoidance of direct contact with the skin or clothing, and of breathing fumes. Where the skin has been contaminated, soap and water will provide adequate cleansing. While handling the fluid, rubber gloves should be worn.

The chief *fire-extinguishing compounds* are carbon dioxide and carbon tetrochloride. Carbon dioxide spray may cause severe burns if blown on the exposed skin, and it is possible that dangerous concentrations may be encountered in small closed spaces. The dangers of carbon tetrachloride have already been noted under cleaning solvents.

Engine exhaust gases are chiefly important from the possibility of carbon-monoxide poisoning. (See previous description.) The main precaution is adequate ventilation when working in enclosed spaces.

Breathing hot *oil fumes* in inadequately ventilated spaces may give rise to upper respiratory irritation, headache, nausea, and vomiting. Very little difficulty should be experienced if adequate ventilation is provided.

AIRCRAFT EMERGENCY RATION.—The present authorized emergency aircraft ration consists of the following:

1. Pemmican.
2. Malted milk tablets.
3. Sweet cholocate.

Pemmican is packaged in one-fourth-pound cans and consists of the following ingredients:

1. Rendered kidney fat.
2. Prime oleo oil.
3. Seedless raisins.
4. Evaporated apples.
5. Crisp bacon.
6. Peanuts.
7. Dextrose.
8. Shredded coconut.
9. Vanilla extract.
10. Salt.

Three types are furnished: class I lacks the bacon and peanuts; class II lacks the evaporated apples and peanuts, and class III lacks the evaporated apples and bacon.

The malted milk tablets are supplied in a glass container holding 3 ounces (about 40 tablets).

The sweet chocolate ¼-pound bar contains cholocate, sugar, oat flour, milk, vanillin, vitamin. B. Caloric value of the cake is 600 calories.

Total caloric content of the ration is 4,000 calories.

Emergency water is supplied in cans, 8 ounces to each can, 3 cans per person.

FIRST-AID KITS.—First-aid kits for pneumatic life rafts are furnished as a single-unit package. Contents of this six-unit package are as follows:

1. Six Syrettes (morphine tartrate).
2. One iodine applicator (bottle type, 10 cc.).
3. Two tubes of burn ointment (tannic acid).
4. Two one-half-inch bandage compresses.
5. Sulfanilamide (for topical application, 5 gm. per packet, 5 packets).

This first-aid kit is supplied for all one-, two-, and three-place aircraft.

A large 10-unit first-aid kit is supplied for long range patrol aircraft carrying larger crews. Contents of this package are:

1. Six morphine Syrettes (morphine tartrate).
2. One iodine applicator (bottle type, 10 cc.).
3. Two tubes burn ointment (tannic acid).
4. One package sulfanilamide powder, five 5-gm. packets.
5. Sulfadiazine (twenty-four 1-gm. tablets).
6. Four 1-inch compresses.
7. One triangular bandage.
8. One web tourniquet.
9. One battle dressing, small.

10. One package scissors, safety pins.

It is quite evident that the contents of the two first-aid kits will not meet all the needs of personnel operating under unusual conditions. However, it is expected that local medical establishments, after determining the needs, will provide supplemental supplies as required.

DUTIES OF MEDICAL OFFICERS ATTACHED TO AVIATION ACTIVITIES.—It is fundamental that a medical officer should thoroughly acquaint himself with the personnel and material of the station or ship to which he is attached. He should know the type or types of aircraft, the number and duties of the crew, seating arrangements, type of heating, endurance, range, ceiling and types of oxygen equipment installed. He should establish himself as a part of the squadron (or squadrons) and become a part of its administration. He must identify himself with all aspects of squadron life, whether in the crew room, on the sports field, or in operational phases, and he should be available at all times for interview and for requests requiring his special attention. In addition it is necessary that medical officers take part in routine medical duties, including sickbay duties, and in every way assist in cooperation between the Medical Department and commanding officer.

REST, RELAXATION AND SPORT.—Recreational activities are highly important as a means of maintaining morale and efficiency. All efforts should be made to secure, as far as possible, 8 hours' sleep out of 24 for operating personnel. During periods of rest (stand-off from operations), idleness or slackness should not be tolerated. The most beneficial form of relaxation from restricted and emotionally toned effort is to be found in exercise of the body and mind in play, and every effort should be made ashore and afloat to provide sports for personnel. Such sports as wrestling, boxing, handball, shuffleboard, etc., are readily adaptable on board ship and allow a considerable range of personal preference to supplement the more diverse activities that can be indulged in ashore.

CHAPTER 14

SUBMARINE MEDICINE

A submarine is a vessel so constructed that it can either cruise on the surface or submerge and proceed below the surface. This type of ship has a shaped hull, built to withstand great pressure, and a free-flooding superstructure which forms the weather deck. When on the surface these vessels are propelled either by direct-drive Diesel engines or Diesel-electric combinations. When submerged they operate on electric motors driven by current from storage batteries made up of 120 to 252 1-ton lead-acid cells. These batteries are charged by Diesel operated generators. When submerged visual contact with the surface is maintained (to a keel-depth of about 60 feet) by means of periscopes. On the surface communication is accomplished either by visual or radio signals. While submerged radio reception is possible. Compartmentation by watertight, thwart-ship bulkheads divides the pressure hull into several sections. In the later type of submarines these are: The forward torpedo room, the forward battery room or officers' quarters; the control room; the after battery or crew's quarters; the engine rooms; the maneuvering room; and the after torpedo room. Intercompartment passage is possible through small, quick-closing doors.

Submarines have main ballast tanks which are carried *dry* for surface operations and are flooded upon and during submergence. These tanks are so designed that their volume is exactly equal to the displacement of that part of the ship which is above the water line. When these tanks are flooded, the over-all weight of the ship exactly equals the over-all displacement and thus the ship is in neutral buoyancy. Depth control is effected by means of the forward motion of the ship and the use of bow and stern planes. Minor variations in weight caused by the addition or use of stores, fuel, etc., are compensated for by flooding or pumping the variable tanks. These tanks are: Forward trim, located in the forward part of the ship; auxiliary, at the center of gravity of the ship; after trim, at the after end of the ship. A trim pump and water manifold are installed for transfer of water between this group of tanks and the sea.

The submarine is brought to the surface by blowing the water from the main ballast tanks with compressed air.

Because of the unusual construction and function of these vessels there are numerous problems of a nature which need emphasis, particularly air conditioning, diet, maintenance of health and sanitation, and selection of personnel, all of which are the concern and function of the medical officer. (See also section on Ventilation of Submarines in chapter 4).

VENTILATION

Proper ventilation on submarines is of primary importance. In a sealed compartment such as a submarine the air is vitiated by the consumption of oxygen and the production of carbon dioxide and moisture by the ship's company, by the production of heat from the machinery, gases from the cooking, the batteries and the lubricants, etc.; and during the charging of the batteries, by hydrogen and under unusual circumstances, by chlorine gas.

The habitability of a submarine from the standpoint of atmospheric conditions depends upon such factors as pressure, movement, temperature, humidity, and constituents of the air.

AIR PRESSURE.—The air in a submarine is normally under the same pressure as that of the outside air. During a dive the pressure increases slightly due to compression of the hull and to venting of the tanks inboard. However should an escape with the submarine escape appliance (the *lung*) be necessary, the air pressure within the compartment which is being flooded must be permitted to increase until it equals the pressure of the sea water for the

depth at which the submarine is submerged (which allows the opening of the escape hatch).

AIR MOVEMENT.—While a submarine is operating on the surface in a calm sea, its ventilation may be accomplished naturally through the hatches. However it is often necessary to close all the hatches except the conning tower hatch and in that case air is taken through this hatch and the main induction system. Forced draft blowers take air through the main induction and distribute it into the various compartments of the ship. An exhaust system is provided which takes air from the various compartments and delivers it to the engine room where it is discharged through the engines.

When the vessel is submerged the air movement is controlled by the same system, except that air is no longer exhausted through the engines but is returned to the supply system through the air-conditioning unit, which cools and dehumidifies it. These methods of air movement are supplemented by use of compartment electric fans and portable blowers.

AIR TEMPERATURE.—The temperature within a submarine is often extremely high, especially in the tropics. Running submerged some cooling is obtained by conduction through the hull on account of its contact with the cooler sea water. The newer type submarines are equipped with an air-conditioning plant. When the air-conditioning unit is functioning it effectively lowers the temperature and humidity. Submarines on extended patrols in tropical waters have reported that air conditioning makes a vital difference in the staying power of the crew.

AIR HUMIDITY.—The relative humidity of the air in a submarine can be determined by wet and dry bulb (psychrometer) reading (see table 7). This often approaches the saturation point, particularly during an extended submerged run. Moisture is given off from the skin and lungs at the rate of approximately one ounce

Table 7.—RELATIVE HUMIDITY TABLE

Air Temperatures	Difference Between the Dry and Wet Thermometers																														Air Temperatures
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	39	30	
30	100	89	78	67	57	47	36	26	17	7																						30
45	37	28	19	12	35	100	91	82	73	65	54	3																				35
40	100	92	84	76	68	60	53	45	38	30	22	16	8	1																		40
45	100	92	85	78	71	64	58	51	44	38	32	25	19	13	7	1																45
50	100	93	87	80	74	67	61	55	50	44	38	33	27	22	16	11	6	1														50
55	100	94	88	82	76	70	65	59	54	49	43	39	34	29	24	19	16	10	6	1												5
60	100	94	89	84	78	73	68	63	58	53	48	44	39	34	30	26	22	18	14	10	6	2										60
65	100	95	90	85	80	75	70	65	61	56	52	48	44	39	35	31	28	24	20	17	13	10	6	3								65
70	100	95	90	86	81	77	72	68	64	60	55	52	48	44	40	36	33	29	26	23	19	16	13	10	7	4	1					70
75	100	95	91	87	82	78	74	70	66	62	58	55	51	47	44	40	37	34	31	27	24	21	19	16	13	10	7	5	2			75
80	100	96	92	87	83	79	75	72	68	64	61	57	54	51	47	44	41	38	35	32	29	26	23	20	18	15	13	10	8	6	3	80
85	100	96	92	88	84	80	77	73	70	66	63	60	56	53	50	47	44	41	38	36	33	30	28	25	22	20	17	15	13	11	9	85
90	100	96	92	88	85	81	78	75	71	68	65	62	59	56	53	50	47	44	41	39	36	34	32	29	26	24	22	20	17	15	13	90
95	100	96	93	89	86	82	79	76	72	69	66	63	60	58	55	52	49	47	44	42	39	37	35	32	30	28	25	23	21	19	17	95
100	100	97	93	90	86	83	80	77	74	71	68	65	62	59	57	54	51	49	47	44	42	39	37	35	33	31	29	27	25	23	21	100
105	100	97	93	90	87	84	81	78	75	72	69	66	64	61	58	56	53	51	49	46	44	42	40	38	35	33	31	30	28	26	24	105
110	100	97	94	90	87	84	81	78	76	73	70	67	65	62	60	57	55	53	50	48	46	44	42	40	38	36	34	32	30	28	27	110
115	100	97	94	91	88	85	82	79	76	74	71	69	66	64	61	59	57	54	52	50	48	46	44	42	40	38	36	34	33	31	29	115
120	100	97	94	91	88	85	83	80	77	75	72	70	67	65	62	60	58	56	54	51	49	47	45	44	42	40	38	36	35	33	31	120
125	100	97	94	91	88	86	83	80	78	75	73	70	68	66	64	62	59	57	55	53	51	49	47	45	43	42	40	38	37	35	33	125
130	100	97	94	91	89	86	83	81	78	76	74	71	69	67	65	62	60	58	56	54	52	50	49	47	45	43	42	40	38	37	35	130
135	100	97	94	92	89	86	84	81	79	77	74	72	70	68	65	63	61	59	57	55	53	51	50	48	46	45	43	41	40	38	37	135
140	100	97	95	92	89	87	84	82	79	77	75	73	71	68	66	64	62	60	58	56	55	53	51	49	48	46	44	43	41	40	38	140
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	39	30	

per hour per man at rest. This amount is greatly increased by bodily activity. Moisture is also given off from the food in cooking and from the batteries by evaporation. High relative humidity with high temperature causes considerable discomfort to the crew. It causes the bulkheads to drip moisture, and makes all clothing, mattresses, etc., continually damp, thus adding to the health hazards among the crew.

AIR CONSTITUENTS.—Normally the air within a submarine operating on the surface does not vary greatly from outside air, but during extended submergence the composition of the air may become so altered by vitiation and contamination as to be dangerous. The gases important in this connection are discussed below.

Carbon dioxide.—This gas is formed continuously in the body by oxidation of carbohydrates in the tissues. Increasing the oxygen tension has no beneficial effect unless the excess carbon dioxide is removed. The R. Q., or respiratory quotient, is given by the fraction $\frac{CO_2 \text{ produced}}{O_2 \text{ consumed}}$. For normal use this ratio of volume of carbon dioxide produced to volume of oxygen consumed averages 0.82. The normal oxygen consumption per man aboard submarines has been determined to be 0.9 cubic foot per hour, thus the carbon dioxide produced per man per hour may be calculated by 0.9×0.82 or 0.74 cubic foot. Thus a submarine of about 26,000 cubic feet of air space, such as a large S-boat with a crew of 50 men, may safely operate submerged for about 20 hours without releasing oxygen or absorbing carbon dioxide. This may be calculated by the formula $X = 0.04\frac{C}{N}$ where X is number of hours submerged; C is net air space in cubic foot; N is number of men in crew. Further information on the habitability from this point of view may be found in the *Manual* of the Bureau of Ships.

Each submarine is equipped with a Higgins-Merriott colorimetric alkaline-phenolphthalein carbon-dioxide indicator. This is very simple to use and all submarine personnel are required to be familiar with its operation.

There are individual variations in tolerance of carbon dioxide, but in general, tensions below 3 percent cause mild symptoms; between 3 percent and 6 percent cause headache, discomfort, and deep breathing; between 6 and 9 percent cause extreme distress, panting, and collapse; above 9 percent causes death quickly. Particularly if flooding for escape is contemplated, it is of vital importance that as much carbon dioxide as possible be eliminated from the atmosphere. For, as is the case with oxygen, *the physiologic effect of the carbon dioxide is in direct proportion to its partial pressure* (which is a function of the percentage and the pressure in terms of atmosphere).

The removal of carbon dioxide is accomplished by the use of the CO_2 absorbent, which is spread in mattress covers when necessary. The complete description of the method of testing for carbon dioxide and the use of the absorbent also is contained in the *Manual* of the Bureau of Ships.

Oxygen.—Oxygen is a colorless, odorless gas which constitutes 20.93 percent of the atmosphere. It is physiologically necessary for life and should not be allowed to fall below 17 percent. Inasmuch as carbon dioxide is produced as oxygen is consumed, there is usually ample warning of oxygen lack, simply by evidence of the increase of carbon dioxide. The classical symptoms of anoxemia are weakness, vertigo, cyanosis, nausea, and collapse. However, oxygen deficiency usually gives no warning, and collapse may be the first symptom, noted. No test for oxygen tension is provided in submamarines. However, the approximate oxygen percentage of the air in any given compartment, as altered by respiration, can be found by multiplying the carbon dioxide content by 1.22 and subtracting this figure from 20.93. A practical indication of the amount of oxygen in the air is obtained by striking a match. If the wooden part of the match will not burn, lack of oxygen is at or beyond the danger limit. Oxygen cylinders are provided in each compartment on board a submarine and oxygen is "bled" into the boat as follows: Sufficient oxygen is released from the cylinder to cause a drop in the gage pressure of the cylinder in pounds per man equal to 13.23 divided by the net capacity of the cylinder in cubic feet. This is repeated every hour. Thus, if the volume of the cylinder is 1.53 cubic feet and initial pressure at 1,800 pounds, for S class submarines

with a crew of 43 men, oxygen should be released until the pressure in the cylinder drops $\frac{13.23}{1.53} \times 43 = 372$ pounds, or until the gage reads 1,428 pounds. If the new type oxygen-reducer valves are installed, the low-pressure valve should be adjusted so that the hand on the metering gage is set at the number of men for which oxygen is being supplied.

During the flooding of a compartment preparatory to a *lung* escape, the partial pressure of gases will increase, i. e., at a depth of 165 feet, or 6 atmospheres absolute, the oxygen content by volume would still be about 20 percent, but the partial pressure would be increased six times, thereby exerting the physiological effect on the body of 1⅕ atmospheres of pure oxygen. The prolonged breathing of this concentration may be dangerous, therefore the oxygen content before flooding should not be greater than 20 percent.

Hydrogen.—Hydrogen is a colorless, odorless, physiologically harmless, but chemically active gas. An air mixture containing 4.1 percent of hydrogen is inflammable, percentages higher than this may be explosive. Hydrogen in a submarine is produced by electrolysis within the storage batteries, particularly during charging.

A separate ventilating system is provided for the batteries and the air is discharged outboard during surface runs and inboard during submerged runs. Each battery compartment contains a hydrogen detector for determining the percentage of hydrogen in the air of the system. Three percent is the greatest amount of hydrogen permissible in the battery ventilating system.

Chlorine.—This gas is produced in a submarine when sea water comes in contact with the sulfuric acid in the batteries. It is two and a half times heavier than air and remains close to the deck unless disturbed by air currents. It is highly toxic. A concentration of 1 part per million causes coughing; 10 parts per million is dangerous if breathed for half an hour; and 100 parts per million may be fatal if breathed even for a few minutes. The submarine escape appliance, if properly used, will protect against chlorine.

Carbon monoxide.—This gas results from the incomplete combustion of any kind of fuel and is a constituent of the exhaust gases of engines. It is also found after fires or explosions in closed compartments where there is an insufficient supply of oxygen to afford complete combustion. This gas, even if present in concentrations of only 1 part in 10,000, combines with the hemoglobin of the blood to form a stable compound, which will not carry oxygen to the tissues. Carbon monoxide is particularly dangerous because it is odorless, and those exposed to it are often unaware of any ill effects until they collapse. If the presence of this gas is suspected in a compartment, no one should enter unless wearing the *lung* provided with a hopcalite canister filter. Complete discussion of this procedure is beyond the scope of this volume, but additional information is contained in the Bureau of Ships pamphlet entitled, *Submarine Safety—Respiration and Rescue Devices,* which is available to all submarines.

Ozone.—This gas, present in minute amounts around all electrical machines in operation, is generated in appreciable amounts by ultraviolet lamps. Thus if ultraviolet bacteriological lamps are added to the present ventilative installation of any submarine, due precautions should be observed. Ozone is toxic even in a concentration of 0.04 part per million, causing respiratory irritation and pulmonary edema. The presence of ozone can usually be detected by its characteristic odor. Fortunately, recent tests have shown that it does not constitute a hazard in submarines because it is very active chemically, oxidizing metals, rubber, paint, etc., and thus becoming rapidly decomposed.

Tobacco smoke.—This presents a real hazard in the submerged submarine. The effects are those due to the nicotine absorbed by the body; to odor, particularly of stale smoke; and to irritation of the eyes and respiratory tract. The presence of appreciable amounts of carbon monoxide accompanying the smoke has been under investigation. Without discussing the familiar toxic symptoms of salivation, nausea, impending sweat, and a feeling of exhaustion and palpitation, it should be pointed out that tolerance for tobacco varies greatly, and the young individuals are more susceptible than

adults. Some individuals appear to be allergic to tobacco smoke.

Although the acquisition of tolerance protects against unpleasant symptoms within limits, it is certain that the smoke in the rebreathed air of the enclosed space will exert its full harmful effect upon personnel not habituated to the usage of tobacco. It follows that *under these conditions* the usage of tobacco should be forbidden.

Submarine experience indicates that habitual smokers may be somewhat distressed for a day or two, but that they can adapt themselves without hardship to a routine that permits smoking only where ventilation is adequate.

Apart from its inherently toxic effect tobacco smoke, by virtue of its accelerative influence on pulse rate, acts as a complicating variable to confuse estimates of cardiovascular fitness and response to deleterious environment expressed in terms of pulse rate.

BACTERIOLOGY OF THE AIR

Due to the confined living quarters and the peculiar ventilating problems of submarines necessitating rebreathing of the air, contact and air-borne infections may become significant.

Studies on the bacteriology of submarine air reveal bacteria in considerable numbers. *Staphylococcus albus* is the predominant organism, originating probably in large part from human skin and hair. Streptococcal forms from the throat and respiratory tract are also found, as are gram-negative bacilli, molds, and other forms in small numbers. These bacteria are apparently not present in greater amount than in the living quarters of surface craft such as destroyers. Prolonged periods of submergence do not seem to cause an accumulation of bacteria in the air in greater numbers than are found while operating on the surface. Dust counts are apt to be low but the same organisms have been recovered from sweepings as from cultures of air samples. Comparisons of dust and bacterial counts suggest that most air bacteria are present on dust particles stirred up by air currents caused by human activity. The relative humidity of submarine air is usually high enough to cause dampness on the decks and uninsulated surfaces. This may have the effect of laying dust particles and thereby reducing bacterial counts. The presence of numerous oil droplets in the air of certain compartments may also assist in this process. Analysis of the water of condensation collected from the coils of the dehumidifier reveals a nearly sterile water, which would tend to exclude the washing-out effect of dehumidification as a possible mechanism in reducing the number of bacteria in submarine air.

The effect of battery gases on air-borne bacteria is as yet undecided, but there appears to be no lowering of bacterial counts during the time batteries are being charged. Records of extended war patrols reveal that outbreaks of colds and other respiratory infections are apt to occur early in a cruise, with relatively good health in the ensuing weeks. This indicates the prompt spread of the introduced infection and its subsidence after equilibrium is established with the infecting organism, since no new infecting agents are introduced. However otitis externa and trichophytosis, caused by fungi, may persist because of the high temperature and humidity. Control measures under consideration for the prevention of the spread of respiratory infection on submarines include ultraviolet irradiation of the air, the use of germicidal vapors or *aerosols*, such as propylene glycol, and detention periods for the crew before embarking on patrol. This last method might prove impractical, but throat cultures a few days before sailing would prevent trouble by providing for the elimination of carriers of group A streptococci, diphtheria bacilli, and epidemic types of meningococci.

DIET

Because of the unusual living conditions on a submarine, the limited food storage space available, and the length of wartime patrols, careful selection and preparation of the food for submarine crews assumes special importance. Fresh fruit and vegetables in sufficient quantity to last longer than a few weeks cannot be carried; therefore, canned fruit, fruit juices, and vegetables, as well as various dehydrated products, must be included in the supplies. Because they conserve space, dehydrated foods are highly desirable and have recently been

made very palatable. In all cases it is best to carry boned meat to reduce the weight and storage space required. The major part of this should be beef. A good supply of powdered milk should always be on hand.

In addition to the regular diet, all submarines are provided with multiple-vitamin capsules, each capsule containing one-half the daily vitamin requirement. The hospitalman is directed to issue these vitamin capsules to the crew during patrols at the rate of one capsule per man per day.

Associated with the problem of diet is the everpresent one of constipation among the submarine crew. Improper eating habits, the small amount of roughage available in the diet, insufficiency of fresh fruits, movement of the ship, and the irregularity of meals and sleep all contribute to this difficulty. In addition, the *head* is difficult to operate. A new type that flushes into a central tank rather than overboard with each operation has been installed on some of the larger submarines. It is desirable that the intake of starchy foods such as bread, potatoes, rice, cornbread, biscuits, and hominy grits be reduced and some of the following be served and eaten at least once daily: prunes, apricots, apples, figs, raisins, fruit salad, or high roughage vegetables.

NOISE

It has been demonstrated that long-continued exposure to the noise of Diesel engines leads to permanent loss of auditory acuity. In addition to such actual loss, the noise and confinement have a deleterious effect on the nervous system and general well-being of the men, increasing nervous tension and fatigue. Further quieting of submarine engines is desirable and the wearing of ear defenders is being investigated.

MEDICAL DEPARTMENT

Since the maintenance of the health and well-being of submarine crews is a specialized problem, the medical department representative charged with this responsibility should be an especially qualified man. The hospitalman assigned to a submarine is a picked "independent duty" man and his duties are manifold. He not only takes care of the general medical department activities, i. e., care of the sick, first aid, and care of the injured, transfer of those beyond the scope of his care to shore or tender activities, but he also has numerous routine ship's company duties assigned to him. He issues the vitamins and stimulants (as, for example, to the lookouts exposed to inclement weather for long periods) and supervises the daily treatment of all the crew and officers with the ultraviolet "sun" lamp carried in submarines.

PERSONNEL SELECTION

In view of the foreging considerations, the mechanical complexity of the submarine, the cramped living conditions which necessitate close personal contact among the crew, and the fact that each member of the crew must be able to handle more than one job, it becomes obvious that careful selection is necessary to make sure that the men entering the submarine service are in good health and are temperamentally fit for this special duty. The physical standards set forth in the *Manual* of the Medical Department of the U. S. Navy are high and their purpose is to eliminate all those individuals with any chronic disease (upper respiratory infections, gastritis, venereal disease, etc.) or who are otherwise physically unfit for this duty. In addition to fundamentally good health, it is necessary that the men be qualified on the basis of their level of intelligence and emotional stability. This is accomplished by administering mental tests for the determination of intelligence quotient and by conducting neuropsychiatric examinations. These tests have been found to furnish valuable data to supplement the purely physical picture. In cramped quarters, in overheated, damp air, away from natural daylight and sunshine, the close contact for long periods of time makes intolerable those mental and emotional defects which would otherwise cause no trouble.

Supplemental examinations are employed to determine physical and mental ability to operate special submarine devices, particularly soundgear.

CHAPTER 15

DEEP-SEA DIVING

The prevention of compressed-air illness depends upon the elimination of nitrogen absorbed during exposure to increased barometric pressure without allowing it to cause excessive bubble formation in the blood stream, and it is the function of the medical officer to give instructions with regard to it. The following discussion will be found helpful.

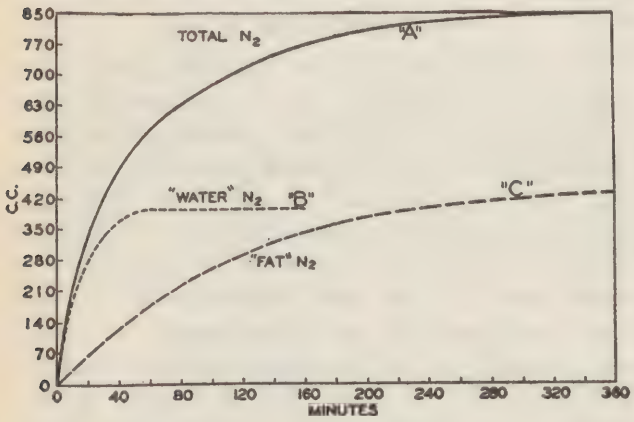


Figure 40.—Solid line shows nitrogen elimination from a young lean man weighing about 60 kilograms. The nitrogen in the body is soluble in fat and fluids. The elimination or absorption of this nitrogen with changes in barometric pressure is represented by the hypothetical, broken-line curves on the graph. (Am. J. Physiol., 114: 138, 1935.)

From figure 40 it is observed that about 75 percent of the total body nitrogen is eliminated at a comparatively rapid rate and hence does not usually contribute to the formation of bends. There appears to be, however, a relatively small amount of gas in the fatty bone marrow that requires many hours for proper elimination.

At a depth of 90 feet, for example, 10.5 hours of air decompression were required following a 9-hour exposure (probable saturation). On the other hand, a 2-hour exposure (75 percent saturation) at the same depth required only 59 minutes for decompression (table 8). Nine and one-half hours were therefore required for the dissipation of the remaining excess gas amounting to but 25 percent of the total present in the body tissues.

From our point of view the body may be compared with a mixture of water and fatty material contained in a beaker. Of the fat an

Table 8.—CHAMBER DECOMPRESSION FOLLOWING PROLONGED EXPOSURE IN COMPRESSED AIR

Simulated Depth (Feet)	Exposure Time (Hours)	Decompression Time (Minutes)	Remarks
30	12	1	No symptoms.
38	5	1.5	Do.
38	7	1.5	Do.
38	9	1.5	Bends 3 hours following decompression.
38	9	1.5	No symptoms. Oxygen 6 hours at surface.
38	12	1.5	Bends 2.5 hours following decompression.
38	12	1.5	No symptoms. Oxygen 6 hours at surface.
60	6	(air) 69	No symptoms.
60	12	(air) 237	Bends 10.5 hours following decompression.
60	12	(air) 311	No symptoms.
Diver C.			
60	12	(O_2) 79	Oxygen 2.2 hours at surface. No symptoms.
60	12	(O_2) 79	Oxygen 4.3 hours at surface, bends 5 hours following decompression.
Diver S.			
90	2	(air) 59	No symptoms.
90	6	(air) 310	Do.
90	9	(air) 458	Bends 2 hours following decompression.
90	9	(air) 583	Bends 1 hour following decompression.
90	9	(air) 638	No symptoms.

important fraction is surrounded by bone representing marrow and spinal cord substance. This bone-contained fat may be considered as lying in the bottom of the beaker.

If the contents of the beaker are now exposed to a high nitrogen pressure for a short period of time and then quickly returned to atmospheric pressure, diffusion of the nitrogen will take place from the water into the surrounding air and also into the unsaturated water and fat. Following short exposures the partially saturated fat appears to act as a buffer against bubble evolution. By contract, after long exposures the large reservoir of nitrogen in the saturated fat constitutes the predisposing cause to embolism. The nitrogen within the bone, moreover, will require many hours for removal.

With reference to the matter of tolerance for abrupt reductions in pressure, the body may be exposed to a compression of 4 atmospheres for a period of 27 minutes followed by a rapid decompression to the normal level in 2 minutes. A period of 90 minutes, however, at the same pressure and followed by the same period of decompression would prove fatal.

The nitrogen absorbed in the early part of decompression and presumably dissolved in the body fluids is therefore readily eliminated by any method of decompression. In the rapid drop from 4 to 1 atmosphere, a degree of supersaturation appears to be tolerated by the body approaching a ratio of 4 to 1. By contrast, when the body is saturated at a pressure of 4 atmospheres, requiring a saturation period of 9 to 12 hours, a ratio indicative of supersaturation of only 1.2 to 1 will not hold throughout the whole period of decompression.

Furthermore, during rapid decompression in the low-pressure chamber, apparent ratios between the pressure of gas in the body and the ambient pressure of 3 to 1 or even 4 to 1 exist, i. e., 1 atmosphere to 0.33 atmosphere or to 0.25 atmosphere.

On the basis of these facts the degree to which the body appears to hold gas in a state of supersaturation is *relative* and depends not not upon the degree of saturation but also upon the pressure level.

Application of physiologic principles.—The important consideration is not mastery of a method of computing the decompression table on the basis of a ratio but rather the acquisition of an understanding of the *basic* physiologic principles, of which one of the most important is the realization of the difficulty in getting excess nitrogen out of fatty tissue, especially bone marrow.

From the point of view of field practice this difficulty has been overcome by progressively limiting the time of exposure in compressed air as the working pressure is increased. The New York State tables (table 9) represent the culmination of this type of experience.

Table 9.—PRESSURE SHIFTS AND INTERVALS OF WORK FOR EACH 24-HOUR PERIOD (NEW YORK STATE TABLES)

Pressure		Hours			
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Minimum number of pounds	Maximum number of pounds	Maximum total	Maximum first shift in com. pressed air	Minimum rest interval in open air	Maximum second shift in compressed air
Normal	18	8	4	½	4
18	26	6	3	1	3
26	33	4	2	2	2
33	38	3	1½	3	1½
38	43	2	1	4	1
43	48	1½	¾	5	¾
48	50	1	½	6	½

Value of helium-oxygen mixtures.—Since the objection to long exposures lies in the difficulty of eliminating the gas dissolved in fatty substance, the employment of helium with its low solubility-coefficient in fat would appear to be ideal.

In diving tests, following short exposures in the compressed helium-oxygen or air atmosphere, the body fluids are well saturated with either gas and no particular advantage in decompression accrues from the use of helium (table 10). Following long exposures, decompression time may be reduced as much as 75 percent. Part of the reduction in decompression time is brought about by the inhalation of oxygen at the lower decompression stops, but the important factor is the lessened uptake of helium by fat.

In altitude-test runs oxygen inhalation for a period of 5 hours is required under certain conditions to prevent aero-embolism. If the body nitrogen be removed and helium substituted, the time for oxygen inhalation can be reduced to at least 90 minutes or a reduction of 70 percent.

In deep-sea diving, exposures are usually short and the advantage derived from helium is that it renders unimportant the narcotic effect of nitrogen as demonstrated in the U. S. S. *Squalus* salvage operations.

Table 10.—COMPARISON OF TOTAL DECOMPRESSION TIME FOLLOWING EXPOSURE IN COMPRESSED AIR AND EXPOSURE IN A HELIUM-OXYGEN ATMOSPHERE

Depth (feet)	Exposure (minutes)	Decompression (minutes)	
		Air	Helium-oxygen
90	100	50	75.
90	180	.....	77.
90	360	.....	79.
90	540	638	79.
150	80	141	121.
150	180	.....	126.
150	360	.....	128.
200	65	217	154.
200	90	.....	164.

Value of oxygen.—Essentially oxygen inhalation permits the elimination of an inert gas at a maximum pressure head as shown by the graph (figure 40), and at a pressure level sufficiently high to prevent injury from massive bubble evolution.

During the past 3 years the Navy has used oxygen routinely in helium-oxygen diving during the latter part of the decompression period, beginning at the 60-foot level.

In air diving the British have had a great deal of experience with oxygen inhalation and the reader is referred to the book, *Deep Diving and Submarine Operations,* by Robert H. Davis. A reduction in decompression time of about 40 percent is effected by the employment of oxygen according to British experience.

The data in table 8 demonstrate the value of oxygen inhalation following decompression at the surface level. Thus the depth could be increased from 33 to 38 feet provided that oxygen was inhaled following abrupt decompression to the surface.

The conclusions drawn from these tests are that a considerable reduction in decompression time is brought about by oxygen. On the other hand, the occurrence of bends following a period of oxygen inhalation of 90 minutes during the initial stage of decompression demonstrates again the difficulty in getting rid of the comparatively small residual fraction of nitrogen in slowly desaturating tissue (bone marrow).

Oxygen inhalation undoubtedly serves its best purpose in preventing the serious symptoms of compressed air illness, and its chief value lies in clearing the blood stream and body fluids of the excess nitrogen.

Danger of too rapid ascent to the first stop.—The tendency in diving is to bring men too rapidly to the first stop, which usually is at one-half the depth compared with the original level. This procedure leads to the initiation of the bubble state in the early part of decompression when the pressure head of gas in the tissues is highest.

Symptoms indicative of embolism have appeared during helium-oxygen diving at depths of 180 and 90 feet on two occasions following too rapid ascent from depths in excess of 300 feet. At present for helium-oxygen diving the rate of ascent is limited to 25 feet per minute and an arbitrary period of 7 minutes is taken at the first stop in order to permit the blood to transport to the lungs the large amounts of helium diffusing into the blood stream.

It has been possible to show by actual measurements that too rapid decompression in the early stages leads to an accumulation of gas probably in bubble form so that equal quantities of gas are eliminated during each of the first two 30-minute periods; if the blood stream is not overloaded, about two and one-half times more gas is given off during the first 30-minute period compared with that eliminated during the second period (figure 40).

In air diving the reduction in rate of ascent to the first stop from 50 to 25 feet per minute greatly reduced the incidence of embolism as manifested by the occurrence of pruritus and rash.

Selection of personnel.—A routine physical examination may not be adequate to determine those individuals who are qualified for work in compressed air. One should therefore employ specific *pressure tests* for the selection of fitted men.

With reference to patency of auditory tubes and presumably freedom from infection of the upper portion of the respiratory tract, the immediate application of a pressure of 50 pounds in the chamber will serve to select the qualified men. The assumption is made that the men have previously been instructed in the matter of

"clearing their ears." Inspection of the tympanic membrane following the application of pressure reveals the degree of ability to accommodate to excess pressure. Two tests with an interval of several days intervening should be accorded an applicant who is otherwise in good physical condition.

With reference to susceptibility to bends, it follows from a consideration of the physiologic data that the elimination of excess nitrogen without the development of manifest air embolism depends upon effective blood flow through tissues and the absence of excess fat. The desirable type of man is therefore young and lean. Yet among such individuals the variation in susceptibility to compressed air illness makes necessary a specific decompression test for the selection of deep-sea divers.

This test consists in reducing the pressure from 1 atmosphere to 0.20 atmosphere during a period of 7 minutes. Oxygen is inhaled at the start of pressure reduction. The duration of stay in the rarefied atmosphere is for a period of 4 hours. Under these conditions susceptible men develop bends while those men who are comparatively immune remain free from symptoms. Six to ten successive daily tests accurately define susceptibility status.

Too much stress cannot be laid on the necessity for the maintenance of good physical condition by men who work in compressed air. Empirical data indicate that any condition tending to impair cardiovascular tone renders men susceptible to the development of decompression embolism. Indulgence in alcohol should be specifically interdicted. Fatigue, infection, hot atmospheres, and excess carbon dioxide in the air are all factors associated with increased incidence of bends. Our deep-sea divers, therefore, maintain a system of training similar to that followed by the athlete.

Summary of principles.—The following principles underlie the prevention of compressed air illness:

1. Limitation of time of exposure in compressed air or the employment of helium-oxygen mixtures for saturation exposures.

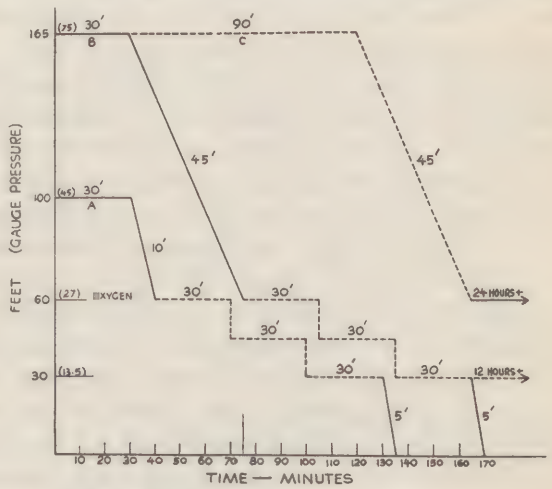
2. Reduced rate of ascent in the early stages of decompression.

3. Slow decompression following long exposures and the inhalation of oxygen at the lower decompression levels.

4. Careful selection and the maintenance of personnel in good physical condition.

TREATMENT OF COMPRESSED AIR ILLNESS.—The prime requirement in treatment is the rapid restoration of normal blood supply by compression and absorption of the obstructing gas emboli. Behnke and Shaw formulated a procedure of recompression utilizing oxygen, based on laboratory experiments, and later Yarbrough and Behnke applied the princiles to field practice.

Recompression.—Essentially the basis of treatment is prompt recompression and the inhalation of oxygen. Figure 41 serves as a guide in the recompression procedure. It is emphasized that the condition of the patient governs the detailed mode of therapy rather than rigid adherence to a system of tables.



A—For "bends."
B—For "bends"—asphyxia.
C—For asphyxia/paralysis.

At maximum pressure patient inhales air, or helium-oxygen of about (70:30 ratio) mixture.

At 60-foot level or below, patient inhales oxygen for 90-minute period. Attendant inhales oxygen for 30-minute period.

For prolonged recompression at or below 60 feet, air is inhaled.

Figure 41.—Guide for treatment of compressed-air illness (after Behnke and Shaw, Yarbrough and Behnke).

Perhaps there is no therapeutic procedure more effective than recompression as applied to the asphyxiated, pulseless, cyanotic patient whose blood stream is filled with multiple gas emboli. Even patients presenting incipient lesions of the spinal cord have made complete recovery under immediate and prolonged recompression.

In the mild cases of compressed air illness

characterized by bends, the minimum pressure applied in recompression is 45 pounds per square inch (gage) equivalent to a diving depth of 100 feet. Relief of symptoms may occur at greatly reduced pressures but the additional compression reduces the size of the bubble 75 percent compared with surface volume, and ensures against the initiation of lesions in the spinal cord.

For the serious cases characterized by asphyxia, probable involvement of the nervous system, or both conditions, recompression is limited to a pressure of 75 pounds (gage) equivalent to a depth of 165 feet. At this pressure the surface size of the bubble has been reduced 83 percent; higher pressures can do little to improve circulation and would unduly delay the pressure at which oxygen could be breathed.

The next stage is the maintenance of the maximum pressure for a period of 30 minutes. Usually this period of time is sufficient to ensure apparently complete recovery, but should paralysis be present or suspected, or if the patient remains unconscious, the maximum pressure is maintained for an additional 90 minutes.

At the maximum pressure, air, or if available, a mixture of helium-oxygen in the ratio of 70 to 30 volumes percent, is inhaled. At the end of the 30-minute period the pressure is decreased uniformly for 40 minutes until the 60-foot level (27 pounds gage) is reached (figure 41B). If a pressure of 45 pounds has been used (figure 41A) a period of 10 minutes is sufficient for decompression to the 60-foot level.

Oxygen inhalation is begun at the 60-foot level and continued for a period of 90 minutes until the 30-foot level is attained. If the patient exhibits an idiosyncrasy for oxygen, the usual symptom being nausea, oxygen inhalation is postponed until the 45-or 30-foot levels are attained. Air or the helium-oxygen mixture is inhaled for the period of time at the 60- or 50-foot levels that would otherwise have been devoted to the inhalation of oxygen.

It is unlikely that intolerance for oxygen will exist at the 45- or 30-foot levels and a period of 90 minutes for oxygen inhalation should be feasible for all patients prior to the termination of decompression.

Decompression is then terminated from the 30-foot level by a uniform drop to the normal atmosphere over a period of 5 minutes.

For mild cases of compressed air illness this type of treatment usually affords permanent relief. Should symptoms recur in more seriously injured patients, recompression is again effected to a level between 30 and 60 feet for a period of 12 to 24 hours followed by a gradual return from the 30-foot level to the normal atmosphere during a period of 4 hours.

This practice of prolonged immersion in compressed air colloquially termed "the overnight soak" has proved to be the conclusive method of terminating treatment. The patient is permitted to sleep and the bubbles have adequate time for obsorption. Should there be any question of involvement of the central nervous system, the prolonged immersion treatment is routinely put into effect.

For the moribund patient, the pressure level following the 2-hour treatment at a depth equivalent to 165 feet, is decreased to 60 feet during a period of 45 minutes. Oxygen is then administered for 90 minutes, and air inhalation is continued for a period of 24 hours or longer. There should be no hesitancy in continuing treatment at the 60-foot level for a period of days. The increased partial pressure of oxygen at this level is also an effective therapeutic measure in treating the incipient or manifest pulmonary edema, anticipated as a complication of extensive embolism of the pulmonary bed (figure 41C).

Adjuncts in treatment are the judicious injection of glucose and saline solutions, or plasma in the severely injured patients in order to counteract the effect of hemoconcentration. The use of epinephrine and the application of warmth (not heat) are additional measures if the shock syndrome is present.

The position of the patient's body should be recumbent since the site of bubble accumulation is influenced by gravity.

Errors in treatment have been:

1. Failure to apply the pressure test in doubtful cases, "It can't be compressed air illness."
2. Delayed recompression. The potential patient avoids the doctor.
3. Failure to keep the moribund patient at the 60-foot level.
4. Failure to keep the "treated" patient near the recompression chamber for a 24-hour period.

CHAPTER 16

FIELD HYGIENE AND SANITATION

It has long been recognized and is an axiom of combat that health of the fighting personnel is essential in war. Preservation and promotion of health of the forces in the field requires attention of the medical office to a number of details, each trivial in itself.

The Medical Department's authority over field hygiene and sanitation is largely advisory. The quantity and quality of medical care is contingent upon the military situation. Military requirements take precedence over medical care and humanitarian needs. The naval service does not furnish funds, installations or labor for field sanitation, hence care of the health of the individual is largely left to the local command, but it is the function of the medical officer to advise and supervise measures to be taken by the command.

FOOD IN THE FIELD.—Troops in the field, as a general rule, have limited opportunity to supplement their military rations by purchase from outside sources and thus are unable to supply any deficiences existing in their food allowance. Hence it is particularly important that the field ration be well balanced as regards to fats, proteins, carbohydrates, and mineral elements and have the required vitamin content.

The daily menu should be prepared at least 24 hours in advance. On the march, or when otherwise engaged in heavy work, troops will have a craving for sweets and a liberal amount of jam should be provided to satisfy this craving.

The mess gear should be washed in boiling soapy water and rinsed in boiling clear water. Surplus and reserve food supplies should be protected from such insects as flies and roaches, dust, dirt, and rodents.

The weight of vitamin-containing foods of an exclusive military ration should be at least 30 percent of the total.

The field kitchen should be located on the side of the camp opposite the latrines and urinals. Every precaution should be made to protect the food from dust and dirt and, if practicable, the field kitchen should be screened.

If the kitchen has a dirt floor it may be oiled with motor oil to control dust.

The food handlers should be instructed and trained in personal hygiene and cleanliness and should be given a physical examination at regular intervals.

The mess halls, screened if possible, should be located near the kitchen. The mess tables should be cleansed and sunned at regular intervals and care must be taken to prevent the collection of food particles in the cracks of the table. This is usually accomplished by construction of a table with a removable center board.

Care should be taken not to cook food too long as this tends to destroy some of the vitamins. During the World War I, scurvy broke out in one organization, and without any alteration in the diet the outbreak was arrested immediately by reducing the period of cooking from 6 hours to 45 minutes.

In Mesopotamia, during the World War I, British troops eating white bread suffered from beriberi while the Indian troops eating bread made of unmilled wheat were unaffected. During the siege of Kut the reverse was the case, the British lived largely on fresh meat while the vegetarian Indians lived largely on white bread.

WATER IN THE FIELD.—As a result of the policy of immunizing naval personnel with the enteric antigens, water-borne diseases have been more or less eliminated. However it is important that water sources be inspected and that sterilization be employed before permitting the drinking of any water from sources that, potentially, may be contaminated. Boiling is the simplest method; however chlorination is the usual method employed.

In the absence of chlorinated lime, tincture of iodine can be used to sterilize water in the canteen or the water sterilizing bag. Two and

one-half teaspoonfuls (10 cc.) of 7 percent tincture added to a sterilizing bag (36-gallon capacity) of water will purify it in 30 minutes. Two drops of the tincture added to one canteen of water and allowed to stand for 30 minutes will sterilize the contents.

Chlorinated lime (bleaching powder, calcium hypochlorite) is prepared by saturating slaked lime with chlorine gas. When freshly prepared, chlorinated lime contains about 35 percent of available chlorine.

Grade A calcium hypochlorite includes such preparations as HTH (high test hypo) and "Perchloron." These compounds are more stable and contain about twice the available chlorine that ordinary calcium hypochlorite contains.

When added to a bagful of water 1 gram of calcium hypochlorite or one-half gram of HTH will yield 2.5 parts of free chlorine per million.

The responsibility for the water supply is usually delegated as follows:

The Marine Corps quartermaster or Navy supply officer.—Procurement of water rights and delivery of water to the camp site.

Medical officer.—In advisory capacity, for quantity and quality of water supply.

The unit commander.—For the proper distribution of the water within the command.

HYGIENE OF THE MARCH.—Care of troops on the march is of paramount importance. The men should be trained in marching by gradually increasing the length of the hike and weight of the pack. The most suitable time to start the day's march is 1 hour after break of day. Night marching should be practiced only when military necessity demands, in which case it should begin soon after sunset. Before leaving camp elimination of the sick and physically unfit is necessary. A sanitary detail must see that the camp site is left in a clean condition and, during the march, see that the road rules of sanitation are obeyed.

The men should start the day's march at a slow pace in order to warm up, and the end of the march should be at a similar slow pace in order to enable the men to cool off gradually.

When marches are of considerable length and forced, singing and whistling of popular tunes should be encouraged. Such stimulation tends to prevent exhaustion by distracting the men from their fatigued state.

Straggling must be avoided. Straggling casualties are due largely to preventable foot disorders and their occurrence creates a nail-foot-sock-shoe problem that requires constant attention. The development of losses, organization difficulty, packing of ambulances and futile employment of medical personnel while on the march can be overcome by rigid adherence to sound rules of foot care. Feet should be inspected before and after every march and all minor disorders should be attended to promptly.

March fracture is a fracture of the second or third metatarsal bone at the junction of the anterior and middle thirds. It occurs in marching with heavy load, especially in double time.

New shoes should not be worn on the march unless they have been broken in.

PHYSICS AND PHYSIOLOGY OF THE MARCH.—Compared to the steam engine the human mechanism is a bit more efficient. The engine is capable of utilizing only 13 percent for useful work from its fuel, whereas our body utilizes 20 percent of the energy value of a consumed diet. The 80-percent balance goes into the production of heat which must be dissipated in order to keep the body temperature constant.

A soldier marching 15 miles carrying full equipment, performs 353 foot-tons of work.

According to Haughton, as quoted by Harrington, this labor, in walking over a level surface, is determined by the following formula:

$\frac{(W + W') \times D}{2240}$ multiplied by C equals number of foot-tons

Where: W equals weight of person.
W' equals weight carried.
D equals distance in feet.
2240 equals number of pounds in long ton.
C equals coefficient of traction.

The coefficient of traction varies for different rates of speed. For 2, 3, 4, and 5 miles per hour, it is approximately $\frac{1}{26}$, $\frac{1}{20}$, $\frac{1}{16}$ and $\frac{1}{14}$, respectively. Thus a man weighing 160 pounds, carrying 40 pounds and walking 15 miles at the rate of 3 miles per hour, will perform an amount of work equavilent to 353.57 foot-tons.

$\frac{(160+40) \times 79200}{2240}$ multiplied by $\frac{1}{20}$ equals 353.57

or, if at the rate of 2.5 miles per hour, 307.45 foot-tons. As we know from physics, one kilogram-calorie equals 3,087 foot-pounds or 1.38 foot-tons.

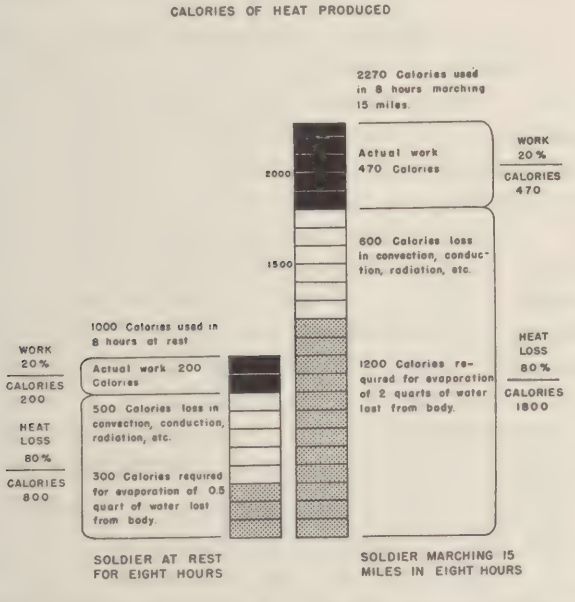
Then 350 foot-tons would require 254 calories or energy as work, but only 20 percent of the calories can be utilized as work, hence the 254 must be increased by 80 percent which will total 1,270 calories.

But the soldier in 8 hours normally expends 1,000 calories, so 1,000 plus 1,270 equals 2,270 calories, which will be the food requirements for a man hiking 15 miles in 8 hours (figure 42).

Heat dissipation.—The evaporation of water acts in dissipating heat of the body in a fashion analogous to the action of the radiator of the automobile in maintaining the motor near a constant temperature.

The evaporation of 1 cc. of water requires 0.5 calorie, consequently the evaporation of a quart of water (1,182.52 cc.) from the body's surface will dissipate 600 calories of heat generated by a marching soldier.

Heat equilibrium.—The human mechanism —similar to the automobile motor—must be warmed up before it can function at its best in marching.



ENERGY BALANCE SHEET PER 8 HOURS AT REST AND ON MARCH OF 15 MILES

Figure 42.

The physiological best temperature for the body in marching is 100.5° F., and 102° F. is the maximum temperature before serious symptoms becomes noticeable such as swaying, tremor, nervousness, etc.

Thus there is only 1.5° range between the optimum body temperature and danger body temperature "and this narrow safety margin indicates alike the delicacy of the adjustment mechanism and the importance of every means of aiding that adjustment."

If the soldier expends 2,270 calories in 8 hours marching 15 miles, 80 percent (1,816 calories) must be lost in dissipating heat.

Of the 1,816 calories, 30 percent is disposed of by radiation, conduction, and convection, while the remaining 70 percent must be disposed of by evaporation of fluids. Since the evaporation of 1 quart of water takes 600 calories, then the total water which must be lost in this 8-hour march is approximately 2 quarts.

CONSERVANCY IN THE FIELD.—Conservancy is a technical name for the collection, removal, and disposal of waste products. As a general rule, while on the march and in temporary camps, burial is the usual method of disposal of waste products; in camps of more or less permanent nature incineration is preferred. In the field, trench latrines, soakage pits, field incinerators, etc., must replace the functions of sewage disposal plants and water-carriage sewage system.

Manure can be taken care of by incineration, chemical treatment, spreading and close-packing (composting or biothermic method).

In the biothermic method, the wetted manure is closely packed in a pile. The fermenting manure will generate a heat of 140° F. to 160° F., while a temperature of 115° is sufficient to destroy the larvae of flies within a few minutes.

At camp sites near the shore on rocky terrain, especially small coral islands, where the surface soil is too shallow to permit trench latrines, short low piers extending into the sea have been satisfactorily used as latrines by military forces. Garbage and refuse are placed in barges, hauled out to sea and dumped.

CAMP AND BIVOUAC SITES.—Before determining the location of a camp or bivouac site a number of military and sanitary factors must

be considered. Available sites or areas in the line of march are investigated and reported on by quartering or reconnoitering parties of which a responsible medical department representative is a member. The final decision as to the site to be used is made by organization commanding officers. In the selection of camp and bivouac sites the medical department representative serves as a sanitation expert and in that capacity makes pertinent reports. Such a sanitary survey is an analysis of the conditions existing in a prospective camp or bivouac site which are considered to influence, favorably or unfavorably, the health of the men expected to be quartered there.

The sanitary aspects of a proposed camp site can be given very little, if any, consideration when an organization is moving into combat. All activities devoted to the preservation of the health of the force must then be governed by the military situation.

The method employed in the moving of troops (by foot, mounted, trucks, tractors, planes, etc.) and the nature of the terrain and "road net" over which they are to pass will limit the number of available camp sites. The physical strain which troops might have to undergo to reach a more distant site may be the cause of eliminating an otherwise desirable location. Because of greater mobility, mounted, mechanized, and air-borne troops may greatly lengthen the daily distance, thereby increasing the number of satisfactory sites, some of which would not be accessible to foot troops.

On the other hand, motorized troops may be confined to the use of highways while foot and mounted troops can be moved over both good and bad roads, over fields and across country. When this occurs foot and mounted troops, although limited by distance, are permitted a wider selection of sites than is available to motorized troops.

The conditions which would be likely to cause and transmit disease among troops must be carefully considered in the selection of a camp site. Taking into careful consideration the sanitary and health conditions of local civil communities, a prospective camp site should be investigated as regards to the following sanitary features:

1. *Water supply.*—An adequate supply of potable water must be available from sources that can be reached, either by the men directly or by animal or motor drawn water carts. All local water used for drinking purposes should be sterilized by boiling or by the use of one of the acceptable chemical methods.

2. *Terrain.*—Ideally, the terrain should be one that permits good drainage during and following rainfall. Therefore flat country overlaid with clay should be avoided. The topography should be rolling and the vegetation, soil, subsoil and first impervious layers of a character that will permit drainage, disposal evacuations and shade conducive to the utmost health and comfort of the men. Troops should not be camped in the neighborhood of swamps or other water-collecting sites or near rank vegetation, all of which are potential breeding-grounds for insects.

In this connection it is of interest that during field maneuvers in the past, one body of troops selected a camp site near a spring-fed, fresh-water basin in order to be near a good water supply. Within a few weeks 60 percent had reported sick with malaria. Another military force that chose to camp only 2 miles away had a negligible incidence of malaria. It is better to transport water and avoid proximity to anopheles-breeding areas whenever possible.

Civil inhabitants.—When practicable, a camp site should be located a reasonable distance from a populated area. The necessity of billeting troops, for short or long stays, in the homes and buildings of a community is likely to occur during war. Every effort must be made by the quartering medical representative to obtain full medical intelligence on the public health condition of the population and community in which the troops are to be billeted, and every safeguard must be taken to protect the troops from infectious disease.

In general, the factors to be considered when selecting a suitable camp or bivouac site are:

1. A rolling, well-drained area having a sandy loam or gravel soil for drainage.

2. Availability of an adequate supply of good water and fuel.

3. Grass and shade trees as wind-breaks in cold weather and protection from the sun's rays in summer.

4. Avoid clay or alluvial soil, marshes and insect-breeding places.

5. Avoid base of hill, ravine or dry river bed.

6. Avoid site of recent camp.

Sanitary orders.—In camp or billets, the sanitary and hygienic measures required to protect the health of troops are stipulated in sanitary orders prepared by the senior medical officer and signed by the unit commander. Such orders apply equally to all elements of the force and designate the duties and responsibilities of all personnel. Specifically, a sanitary order applies to the establishment, use, and maintenance of:

1. Food, mess halls, and kitchens.
2. Water supply.
3. Quarters (tents, billets, or barracks).
4. Personnel hygiene (scrub and wash clothes—bathing).
5. Waste disposal (excreta and refuse).
6. Insect control.
7. Sick call (time, location, hospitalization, and evacuation).
8. Venereal disease control.
9. Physical inspection.
10. Civil community.
11. Special measures.

CHAPTER 17

QUARANTINE RULES AND REGULATIONS

It is unlawful for any merchant ship or other vessel from any foreign port or place to enter any port of the United States except in accordance with the provisions of the quarantine laws and the rules and regulations of state and municipal health authorities.

Every vessel subject to quarantine inspection, entering a port of the United States, its possessions, or dependencies, is considered to be in quarantine until given free pratique. Such vessel must fly a yellow flag at the fore and observe all the other requirements of vessels actually quarantined.

No person, except the quarantine officer, quarantine employees, or pilots, will be permitted to board any vessel subject to quarantine inspection until after the vessel has been inspected by the quarantine officer and granted free pratique, except with the permission of the quarantine officer, and any person boarding such vessel may, in the discretion of the quarantine officer, be subject to the same restrictions as those imposed on the personnel of the vessel.

The following regulations quoted from General Order No. 252, dated 26 September 1944, is the latest data on this subject:

Bills of health are no longer required.

Prior to departure from any port within or outside the continental limits of the United States, the commanding officer of a naval vessel shall obtain the following information concerning communicable disease conditions existing ashore (a) the presence of any quarantinable disease (smallpox, cholera, plague, epidemic typhus and yellow fever) during the period of stay of the vessel at that port; (b) the presence of any other communicable disease that might possibly serve as a hazard of disease introduction as a result of the prospective movements of the vessel concerned. This information shall be recorded in the ship's log prior to departure, and reported in the quarantine declaration.

Naval vessels and all personnel thereon, including civilians, departing from any port or area in which cholera, plague, smallpox, yellow fever, or louse-borne typhus prevails, shall comply with the following pre-embarkation procedures:

1. *Cholera.*—At ports infected or suspected of being infected with cholera, special care shall be taken to provide a safe water and food supply for the vessel. No foods, other than the food supply of the vessel or food accepted for shipment, shall be permitted to be taken on board. Food products which may be consumed in an uncooked state coming from localities infected or suspected of being infected with cholera shall not be accepted for shipment. A person who (a) comes from a cholera-infested area, or (b) desires to embark at an infected port, shall not be permitted to board or remain on board unless such person:

(1) Has been detained five days in an environment known to be free from a source of infection and is without evidence of infection, or

(2) Presents satisfactory evidence of immunization (vaccination) within the previous six months.

2. *Plague.*—At ports infected or suspected of being infected with human or rodent plague, special care shall be taken to prevent rodents, fleas, and infected persons, including individuals exposed to pneumonic plague from boarding the vessel. The following measures shall be carried out:

a. Immediately upon berthing at a pier and during the entire time a vessel lies alongside a pier, it should be fended off at least six feet; all connecting lines shall be properly fitted with rat guards; gangways and other means of

access to the vessel shall be well lighted or separated from the shore at night.

b. The vessel shall load only cargo which has been found free from rats or has been treated to destroy rats and fleas.

c. Prior to departure the vessel shall be inspected for rodents and fleas. If rodents or fleas are present, measures shall be taken that will insure their destruction.

3. *Smallpox.*—A person from an area where smallpox is present who does not present satisfactory evidence of immunity shall not be permitted to embark until successfully vaccinated. Such vaccination, when the disease prevails in epidemic proportions, must have been carried out not less than two weeks prior to departure, and within the previous six months' period. Special care shall be taken to insure that individuals who have shown an "immune response" to vaccination do not actually represent "failure to take" due to impotent vaccine or improper technique.

4. *Typhus.*—An article intended to be transported (including personal effects) if infested with lice, shall not be permitted to be taken on board the vessel at a port infected or suspected of being infected with typhus until such article has been disinfected. A person who (a) comes from an area where typhus prevails, or (b) desires to board at a port infected or suspected of being infected with typhus, shall not be permitted to board a vessel until louse-free.

5. *Yellow fever.*—A person who has been exposed to yellow fever shall not be permitted to embark on a vessel until six days after exposure unless he presents satisfactory evidence of immunization.

PROCEDURES APPLICABLE TO NAVAL VESSELS UPON ARRIVAL

The following regulations apply when the vessel is from a foreign port or irrespective of the port of origin when conditions exist on board, or existed at ports previously visited, which might lead to the introduction of communicable disease at any port of arrival. For the purpose of quarantine, the following are considered domestic ports: Canada, Alaska, Territory of Hawaii, Bermuda, Puerto Rico, Cuba, Virgin Islands, New Foundland, Bahama Islands, Canal Zone, and all extracontinental naval bases not located on territory of foreign sovereignty.

1. If a medical officer is aboard, or if there is a medical officer in the squadron or convoy, the commanding officer of a naval vessel, or the task force or convoy commander, not more than 24 hours nor less than twelve hours prior to arrival, shall send a message by radio to the naval district commandant (or senior naval officer in command at the port of arrival if outside a naval district) and to the local port authority, stating "Pratique certified, G. O. 252." Such a message constitutes a declaration by the commanding officer that the information ascertained, as required in, indicates that no hazard of disease introduction exists, and that the provisions outlined have been fully complied with. When receipt of such a message is confirmed, further quarantine procedures other than the submission of written quarantine declaration will not ordinarily be required. If civilians are aboard and the medical officer has determined that one or more are ill or suspected of being ill with communicable disease, the radio report shall so state when pratique is requested. If any of the following conditions exist, the radio report shall state "Quarantine inspection requested":

a. If cases or suspected cases of cholera, plague, smallpox, yellow fever or louse-borne typhus are aboard.

b. If the vessel is from a port or area within past sixty days where human or rodent plague is present.

c. If the commanding officer or medical officer has knowledge of any circumstances whatsoever which might lead to the introduction or dissemination of disease upon or after arrival.

d. If for any reason preembarkation, requirements have not been fully compiled with.

2. If no medical officer is aboard or in the convoy, pratique may be certified provided: (1) the ship has not visited a foreign port within the previous thirty days; (2) there is no illness on board characterized by fever or skin rash; (3) the ship has not within the previous sixty days visited a port, whether foreign or domestic, suspected of being or actually infected with plague (human or rodent); (4) the commanding officer has no knowledge of any

circumstance whatsoever which might lead to the introduction or dissemination of disease upon or after arrival. If pratique cannot be certified, the radio report shall state "Quarantine inspection requested." The procedures required shall then be carried out.

When the radio request is for quarantine inspection, the commanding officer of the vessel or vessels concerned shall direct that the quarantine flag be hoisted. No person or article shall be permitted to leave the ship until formal release from quarantine is obtained.

The commanding officer of a vessel which has certified pratique by radio immediately upon arrival shall have a quarantine declaration delivered by hand to the local quarantine officer of the United States Public Health Service. In case the port is under exclusive naval jurisdiction, delivery shall be made to the medical representative of the senior officer present ashore. The following is a copy of the Quarantine Declaration:

QUARANTINE DECLARATION

Name and number of vessel:
Date and hour of arrival:
Port:
This is to Certify That:

1. This vessel has visited the following ports during the past thirty days: (State name of each port and period of stay at each port.)

2. Information indicates that no quarantinable disease or other communicable disease of a nature that might lead to disease introduction at this port, existed during the stay of this vessel in any of the above ports except: (State exceptions, if any.)

3. The vessel has not visited a port infected with either rodent or human plague within the past sixty days.

4. The following is the total number of persons aboard:

5. The following civilians are aboard: (State number, and if any are aliens. If a medical officer is on board, state if any are suffering with communicable disease.)

6. There are not cases of quarantinable or suspected cases of quarantinable disease aboard (or, in the case of a ship with no medical officer aboard: "There are no illnesses aboard.").

7. The following animals are aboard, but will not be landed without specific permit (if any are to be landed, so state):

8. The date and findings of the last rodent inspection of this vessel, by a representative of the United States Public Health Service or by an accredited naval rodent inspector, are as follows:

——(Signature of commanding officer.)
——(Signature of medical officer, if aboard.)

The sending of a radio stating "Pratique certified" or "Quarantine inspection requested," or the filing of a quarantine declaration, does not relieve the commanding officer of any vessel of responsibilities provided in regulations other than this general order, concerning the entry of aliens, or the importation of animals, plants, food products, or any other prohibited article. Instructions concerning such matters are contained in general orders or other official publications. In case of doubt on such matters, specific instructions shall be obtained from the port director concerned.

RESPONSIBILITIES OF AUTHORITIES ASHORE

At ports of arrival in the continental United States, its territories and possessions where a United States Public Health Service quarantine officer is located, this officer shall be notified immediately by the Naval District Commandant, or port authority, of the receipt of radio certifications of pratique and of the receipt from a vessel of any other communications pertinent to quarantine. When quarantine inspection is requested, the vessel shall be held in quarantine pending formal release by the United States Public Health Service quarantine officer. If pratique is certified, the quarantine officer ordinarily will take no further action. He has the authority, however, at his own discretion to direct that any vessel be placed in quarantine, irrespective of radio certification, or of statements made in the quarantine declaration.

At ports of arrival outside the continental United States, its territories and possessions and where a United States Public Health Service officer is not stationed, or does not have quarantine jurisdiction, the senior naval officer

in command at the port of arrival shall arrange for a medical officer to board the vessel and shall authorize him to take such steps as may be indicated to preclude the possibility of disease introduction. The responsibility that adequate measures are taken to preclude the possibility of the introduction of disease, and for release from quarantine, shall be assumed by the senior naval officer in command at the port of arrival.

CHAPTER 18

FUNCTIONS OF THE MEDICAL OFFICER ASHORE

The functions of the officer of the medical corps ashore are sundry and diversified.

In the Medical Department orientation course, the duties of the medical officer in the Bureau of Medicine and Surgery, the hospital and other major medical department facilities were categorically discussed. However some further elaboration on the subject is in order and desirable. In this chapter there will be a brief discussion of several important functions of the medical officer ashore not previously taken up.

DUTIES OF MEDICAL OFFICER IN SELECTION OF PERSONNEL FOR THE NAVAL SERVICE

The process of selecting recruits for the naval service begins at the recruiting stations and is continued through the training period of those who are accepted for enlistment. The function of the medical officer is one of greatest importance and responsibility in this crucial procedure for enlistment.

The mission of the recruiting service is to insure by careful selection of applicants that those accepted as enlisted men are individuals of high quality. The minimum standards require they should be of good repute in their home communities, possess at least normal intelligence and a reasonably sound education, be physically fit to perform any of the duties to which they may be assigned and possess the mental capacity to assimilate instruction in those duties. The success of this program depends upon the character and efficiency of the recruiting personnel, upon a continuing policy of establishing and maintaining contacts whereby prospects with the desired characteristics will be obtained, and upon thorough investigation and careful physical examination of all applicants prior to acceptance.

The results of the selective recruiting program have been evident to the general public in the high quality of the men who compose the enlisted force of the Navy, and to the service in increased efficiency of enlisted personnel, a higher percentage of reenlistments and a lower incidence of avoidable losses such as by desertion and by discharge for reasons other than expiration of enlistment. The recruit who can be trained over a period of years to perform the duties and accept the responsibilities of a petty officer is worth two or three who leave after the minimum period of service or who must be discharged for unsuitability. The misfits who must be separated from the service during the first months after enlistment constitute a nuisance, and a hindrance. The time and effort expending in trying to train them has been lost. This could be used better in developing more promising candidates rather than in attempting to correct the errors or in effecting the discharge of those who are readily recognized as inapt for the service.

In addition to meeting the minimum requirements of intelligence, education, and physical fitness, the recruit must possess the constitutional qualities and temperament necessary to adjust himself to service life. He will be called upon to serve under various conditions anywhere the Navy may operate and it will be his duty to assist in the operation and maintenance of the largest and most intricate engineering organization in the world. In time of national emergency the enlisted personnel of the regular Navy who have been well trained in their duties constitute a nucleus upon which the naval forces can be expanded. Under such conditions they will have to assume increased responsibilities and many of them will be advanced to warrant and commissioned rank. It is obvious therefore why the standards for peacetime enlistment must be high and because of this, emphasis is placed on quality rather than on numerical quota. The general public is ac-

quainted with the high character of the men who compose the enlisted force and it is well known that only the specially qualified are accepted. Through emphasizing that a career in the service offers specialized technical training, medical care, certain financial return, and retirement benefits after a definite period of service, no difficulty is ordinarily encounted in obtaining the required quota.

There has been no definite educational standard established for recruits although the regulations require that a candidate shall be able to read and write and that he possess a reasonably quick and clear understanding and be able to do a certain amount of elementary arithmetic. The applicants for enlistment are given a modified intelligence test in an endeavor to determine their general mental qualifications for service, to indicate in a broad way what special aptitude they may present and to eliminate the mentally defective. This procedure is known as the group classification test and was first used at the naval training stations where it was introduced in 1923 by the Training Division of the Bureau of Naval Personnel. It proved so valuable in eliminating mental defectives and providing a means for group classification that in 1931 it was introduced at recruiting stations. During peacetime all of the applicants for enlistment are given this test. No man with a mark below 50 can be enlisted as an apprentice seaman although otherwise desirable candidates of this group may be enlisted as steward's mates. The routine use of the test at recruiting stations, during wartime, is impractical because of the greatly increased number of enlistments. Its use under such conditions in the recruiting of enlisted personnel is limited to the study of borderline cases, the major portion of the classification and psychiatric selection of the recruits being carried out at the training stations.

The physical qualifications required to meet enlistment standards have been established in detail and are based on the principles of sound medical judgment as tempered by previous naval experience. As a basic requirement an individual must be free of organic disease, mental illness, and psychopathic traits. The qualifications may be modified from time to time particularly in relation to dental, visual, and height-weight standards as necessitated by the manpower needs of the service. Those men who have defects which are likely to become aggravated during active duty in the Navy, or which are of such nature that they may later be used as the basis for a claim against the Government are not accepted. This policy is dictated by existing legal provisions whereby a person in active naval service who develops aggravation of a disability which existed prior to enlistment then becomes eligible for certain Government benefits.

Furthermore it is very important that medical examiners enter all defects (deformities, and sequelae of injuries, operations, or diseases) which are noted at the time of enlistment, on the descriptive sheet and medical history sheets of the health record. This is important because it is generally held that once a member of the naval service has passed the required physical examinations for enlistment, he must thereafter be considered as having been in sound mental and physical condition when accepted, excepting where positive facts are presented showing the disability complained of existed prior to his entrance into the naval service. Thus in the event an individual while in the service becomes disabled because of a condition which would appear to have existed prior to enlistment, it is necessary that actual facts be presented in order to rebut the legal presumption of soundness at the time of acceptance. It frequently happens that applicants for enlistment are found to present minor defects which are disqualifying for acceptance according to existing standards. The medical officers do not have the authority to either ignore or waive these defects.

However, a recommendation may be submitted to the Navy Department for waiver providing the defects are considered not sufficient to disqualify for the performance of duty and are not of a progressive nature or likely to become aggravated by service. The Navy Department policy regarding waiver of such defects is influenced by the fact that certain conditions which may appear insufficient to disqualify for enlistment often become aggravated by service; whereas others are of such nature that the individual may complain of symptoms therefrom in order to avoid undesirable assignments. There

are other applicants who present disqualifying defects which are amenable to surgical correction. The medical officers can assume no responsibility, either for themselves or for the Navy, in fitting such applicants for enlistment and are not permitted to operate with a view to qualifying them. Furthermore, no assurance can be given a prospective recruit that he will be enlisted once he has obtained correction of an otherwise disqualifying defect.

There should be no doubt as to the physical fitness of recruits. They must be free from any defect or pathological condition which would interfere with the performance of the duty expected of them in the service, or which would as a result of service be especially liable to undergo progressive change or to become the basis of a claim against the Government. The examining surgeon must remember that all candidates examined are, unless specifically excepted, enlisted for the performance of all duties pertaining to the naval service ashore or afloat. The individual's condition must be carefully weighed in relation to the duties he may have to perform, inasmuch as candidates for special ratings need not possess the physique and endurance of those actively engaged in strictly military duties.

The presence of slight defects in those who have matured or in those who have had previous military or seafaring experience has less significance than in the cases of youthful applicants who have been adjusted to occupations of a more confining and less rigorous character. It is recognized that regardless of the thoroughness of the enlistment examination, some cases with conditions such as asthma, peptic ulcer, glycosuria, so-called orthostatic albuminuria, psoriasis, and the like, because of the peridicity or seasonal nature of such conditions, will be enlisted while symptom-free. These individuals either constitute a potential liability to the Government from a pension or compensation viewpoint or are not physically qualified to perform all of their duties and therefore must be discharged by medical survey at such time as their disabilities are recognized.

It is desirable that the character of the applicant for enlistment be studied carefully and his antecedents and general reputation in the neighborhood inquired into insofar as possible prior to his acceptance. The existence of certain constitutional conditions or of latent mental illness may not be detected because of lack of trained personnel, proper facilities, and the necessary time to make a complete analysis of the individual's inherent constitutional characteristics and the influence of his past environment and previous training. The formulation of an opinion, however, as to character, personality, ability, and desirability will be greatly aided by a review of the applicant's past history, and school and occupational record obtained from his relatives, neighbors, family physician, and former employers.

At such time as the foregoing procedure has been completed and the applicant's enlistment effected, arrangements are made for his transfer to a training station where he will undergo the regular recruit training program. While such an individual is a potential unit of the service, experience has proved it necessary that he receive detailed clinical, laboratory, and neuropsychiatric study upon arrival at the training station. It has been found advisable to concentrate here the trained personnel, special equipment, and observation wards necessary to detect obscure disease, latent or pre-clinical mental illness, personality defects, and abnormalities of temperament. The medical examination is rigid and thorough and includes X-ray chest study as an aid in eliminating those with pulmonary tuberculosis or other conditions of such nature as may be of present or future clinical significance; and blood serological study to eliminate those with syphilis. Any physical conditions or defects which may have been overlooked at the recruiting office are searched for and, if found, are recorded. If the disability is of a minor nature its presence is simply noted in the health record, but if it is more serious in nature and not necessarily a cause for rejection, a request for waiver is submitted by despatch or letter to the Navy Department. When such conditions are probable or possible causes for rejection the recruit is either kept under observation in a duty status or transferred to a naval hospital for further study and disposition. Those who are obviously disqualified are immediately brought before a Board of Medical Survey with a view to discharge.

It is recognized that incident to enlistment certain military ineffectuals consisting largely of the constitutionally inadequate, some of the borderline mental defectives, and a few preclinical psychotics will escape detection or be able to conceal their condition. This is true because it is often difficult to determine during the time an applicant is under observation in a recruiting office, whether he presents a personality defect or is suffering from or is predisposed to mental disease. The number of such cases enlisted during peacetime recruiting is negligible compared to the number accepted during wartime mobilization. This is understandable when it is realized that peacetime recruiting is conducted by medical officers of the regular Navy who have had long naval experience, are thoroughly familiar with the required standards and cognizant of the difficulty those individuals with psychopathic personalities experience in adjusting to service situations. Furthermore, in peacetime recruiting there are long waiting lists of applicants for enlistment, and only a small percentage consisting of the most desirable candidates, need be taken.

The situation during wartime mobilization is quite different. Much of the recruiting must be carried out by medical personnel only recently called to active duty from civilian life, many of whom have from the nature of their former occupation had little or no previous naval experience. Furthermore a much higher percentage of applicants must necessarily be accepted, and, as noted previously, it is not practicable under these conditions to give all accepted applicants the group classification test prior to enlistment. Thus during wartime mobilization it has been found necessary to establish special units to detect those who would be a continual handicap through chronic inaptitude and inefficiency or who by breaking down at some critical moment might seriously disrupt the functioning of their entire unit.

To meet this need the Navy Department has set up a special organization at each training station. The incoming recruits receive special psychiatric study as a part of their medical examination. This is conducted by a psychiatric unit composed of qualified psychiatrists who are aided by well trained psychologists. Such psychological tests as modern science has shown practicable are used in order to reduce to a minimum the number of unsuitable, inapt, and undesirable individuals introduced into the service. A high percentage of these individuals can be detected by trained personnel in the course of a 3-minute examination, but with borderline cases a period of observation on the psychiatric ward is often necessary, and some require a period of observation under training conditions. At any time during the training period the company commanders may refer backward, poorly adjusted, or seemingly maladapted individuals to this unit for further study and investigation. By analyzing the inherent capacity of the recruits it can be determined whether the material is sufficiently good to work with and also whether there are present, traits which will make certain phases of naval life difficult or impossible. Such cases as are considered unfit for continuation in the service are referred to a special board for review and recommendation as to disposition.

This is known as an aptitude board and functions directly under the commanding officer of the training station. It is composed of line and medical officers of long naval experience, medical officers who are qualified psychiatrists, and a psychologist. The boards are guided by the knowledge that under all-out wartime mobilization a certain percentage of all recruits arriving at naval training stations will prove unsuitable service material. They recognize that the waging of war places a tremendous stress on combat personnel and that those personalities already heavily burdened by anxiety are apt to break under this stress and become disabled by acute anxiety states, confusion, or panic.

The prevention of these acute disturbances is important because of their "psychic contagiousness," their tendency to spread through the unit, and the rapidity with which they tend to disable others whose feelings of personal security are threatened from within. This is costly to combat efficiency and precautionary measures are vital. With this in view, therefore, and a detailed psychiatric analysis of such cases available, the aptitude board interviews them and makes appropriate recommendations to the commanding officer of the training station

who is authorized to effect the discharge of those individuals considered unsuitable for retention in the naval service.

At such time as those recruits who have been found qualified have completed their regular recruit training they are transferred to technical schools for vocational training, to the fleet, or to other assignments in the service. It is expected that these individuals when placed in this new environment will be called upon to make certain adjustments. For the most part they have been accustomed in civil life to an existence where strenuous or prolonged physical exertion, emotional stresses and life's complexities are at a minimum.

They are called upon suddenly to enter upon a strenuous physical hardening process, an altered mode of living, and to break home ties and make new friends. There is no way of determining whether many of these cases are suitable service material except to give them a trial on active duty. Having completed their preliminary period of basic training they may be assigned to situations requiring considerable responsibility and technical skill. A number of these men fail, not because they are physically defective or lacking in the intellectual equipment with which to cope with their problems, but because they are temperamentally and emotionally inadequate to meet the situation. Under such conditions the psychopath has more difficulty in adjusting himself than has any other type of individual. A man with such a personality usually lacks the perserverance necessary for constant application and continued persistent effort, is not likely to be amenable to discipline, and ordinarily cannot comfortably be assimilated in any part of the service without having a detrimental influence on morale. During peacetime recruiting when a well-trained potential nucleus is the goal, it is questionable if even the constitutionally inferior types are to be accepted, although under all-out wartime mobilization such individuals and the medium-grade intellectual types may be acceptable if properly classified and utilized in certain assignments within the organization.

However, those individuals who lack the stamina, the resourcefulness, or the ability to adjust, whether it be physical, mental, or temperamental must of necessity be separated from the service. These latent defects usually become clinically manifest within from 3 to 6 months under service conditions and disposition can be determined then by bringing the individual concerned before a Board of Medical Survey. In this way those persons who have demonstrated their unfitness for continuation in the service by reason of physical defects, or latent, previously unrecognized illness, are discharged by reason of physical disability whereas those who are maladjusted and inapt by reason of personality defects are discharged because of unsuitability.

This review of the recruit selection system in use by the United States Navy indicates the care with which the enlisted personnel are chosen. The process begins in the civilian communities with selective recruiting under the jurisdiction of the navy recruiting service. It is continued during a conditioning period at the naval training stations where highly trained personnel endeavor to eliminate the unsuitable recruits through careful study and detailed analysis of each individual.

Thereafter these men are observed under actual service conditions where those who prove unable to adjust can be detected and removed with a view to returning them to a civilian status. Thus as a result of repeated examinations, thorough study and prolonged observation, only the physically and mentally fit are selected. These individuals possess the qualities which enable them to carry on under adverse conditions of many types. They possess the perserverance to continue through long weeks and months of training practice and under actual war conditions. Most important of all when the ship which they man meets the supreme test of battle the members of the crew will not be found wanting.

DUTIES OF MEDICAL OFFICER ASSIGNED TO U. S. MARINE COMMAND

The senior medical officer assigned to duty with a Marine Corps command functions either as the post surgeon or camp medical officer of such command, depending on the organization arrangement.

The duties of the medical officer assigned to a Marine Corps command, with a few noteworthy exceptions, are similar in character to

those duties required of the medical officer in any shore naval medical facility. The organization pattern and the elements of administration are essentially alike. The primary responsibilities are, as always, the preservation of the health of station personnel and for the care of the sick and injured.

Within a Marine Corps command the senior medical officer is responsible to the commanding general for the efficient operation of the medical service. All official communications should be channelled through the office of the commanding general.

The senior medical officer of a Marine Corps command is frequently assigned to the staff of the commanding general. When functioning in such capacity it is his duty to keep the commanding general informed and to advise him on all matters pertaining to the general medical welfare of the command. He is responsible for making periodic inspections and should report to the commanding general any conditions within the command or community which may endanger the health of either. He should also cooperate with local health authorities on matters of quarantine regulations and inspections.

A well organized medical service should consist of adequate facility to give medical and surgical care to the military personnel and to be able to render emergency treatment to the dependents of military personnel and the civilian workers of the station.

A program of preventive medicine should be established and every effort made for control of malarial, rodent, insect and venereal diseases.

The organizational chart shown herein developed by the Camp Medical Officer, Camp

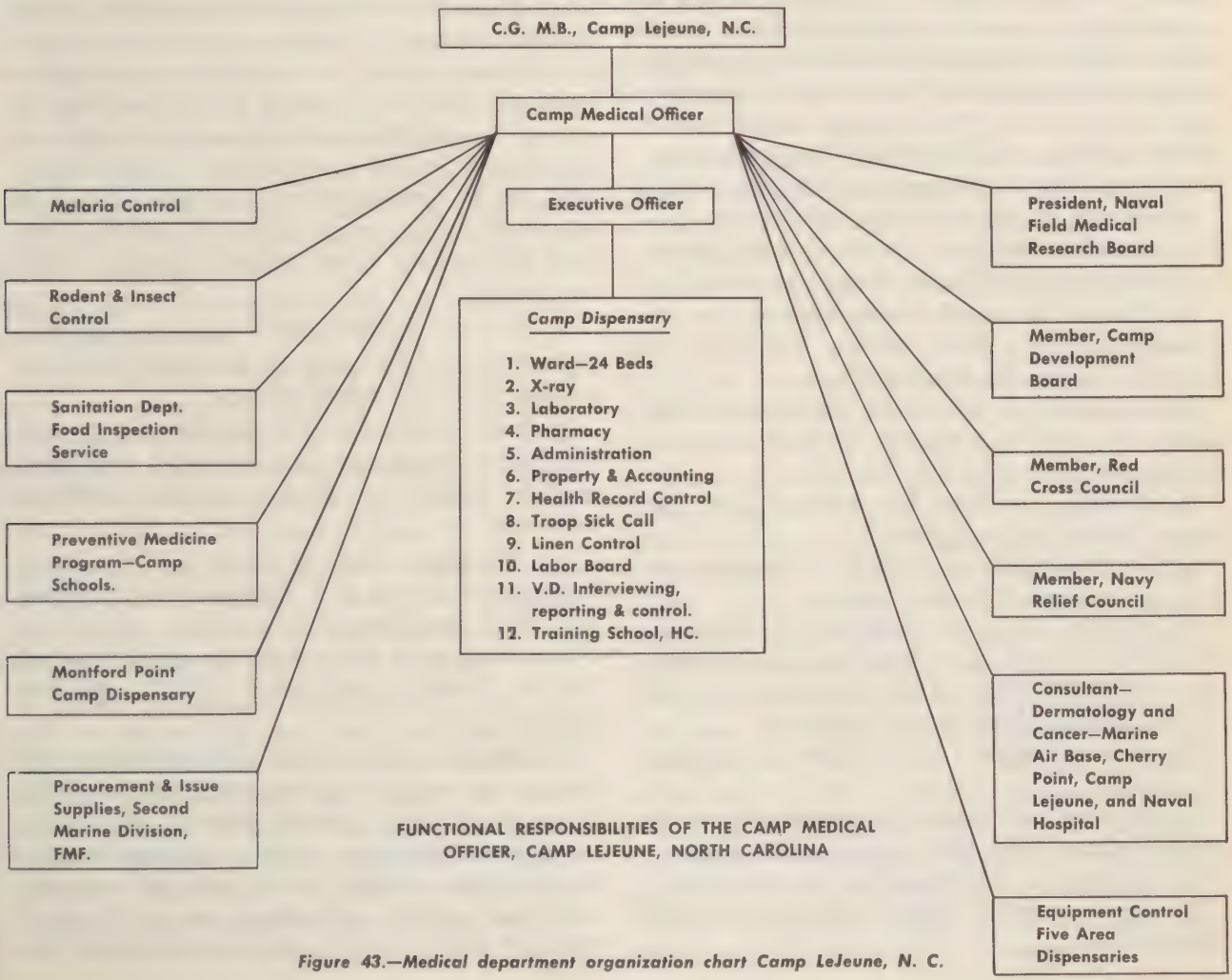


Figure 43.—Medical department organization chart Camp LeJeune, N. C.

Lejeune, N. C. is a typical medical service organization in the Marine Corps. With some modification to meet local conditions it can be used as a standard pattern.

PROCUREMENT OF MEDICAL AND DENTAL SUPPLIES

The Naval Medical Supply Depot under this title was authorized by Secretary of the Navy Morton, on May 26, 1905, and a building located on Flushing Avenue, Brooklyn, N. Y., within the naval hospital reservation was erected for the purpose. This building was evacuated upon the completion of the present building, the third, at Sands and Pearl Streets, October 15, 1918.

The Naval Medical Supply Depot at San Francisco, Calif., is a development of a small depot formerly located in the Mare Island Naval Shipyard. During the period 1929 to 1939 this depot's function consisted chiefly of replenishment issues to ships and minor shore stations. With the growth of the Navy the depot storage was expanded but the two-ocean navy soon demonstrated that a large depot and a better location was required. The permanent depot has been constructed at Oakland, Calif.

While the emergency has modified the routine somewhat, the basic function of the Brooklyn Medical Supply Depot is as follows to:

1. Provide standard medical stores for the fleet and outlying shore stations, and for shore stations within the United States.
2. Maintain on hand, in accordance with approved naval policy, such medical stores as may be designated by the Bureau.
3. Provide facilities for salvage and for repair of medical equipment.
4. Provide laboratory facilities for examination and testing of medical stores.
5. Develop and revise material specifications for medical stores and initiate recommendation for revision of Federal, Navy Department, and Bureau specifications when indicated.
6. Develop logistic data relative to medical stores.
7. Develop and revise commissioning-outfit lists of material for ships and shore stations.
8. Recommend modifications in the supply and supplementary supply tables, annually, October 1.

At Oakland, Calif.:

1. Maintain on hand a minimum quantity of each supply-catalog item of medical stores, except perishables, equal to the average annual issues plus such quantities of reserve stores as may be designated by the Bureau.
2. Establish a maximum quantity of each supply-catalog item of medical stores, except perishables, equal to twice the average annual issues, plus such quantities of reserve stores as may be designated by the Bureau.
3. Establish a replenishment order point for each supply-catalog item of medical stores, except perishables; the replenishment order point is a quantity consisting of minimum quantity plus a quantity sufficient to meet average issues for the number of months normally required to obtain replenishments.
4. Submit normal replenishment requisitions four times annually (following the beginning of each quarter). This procedure should result in replenishment of approximately one-fourth of the items carried, to the maximum quantity, each quarter, and, except for fluctuations in current issues, the replenishment quantities requisitioned should approximate 1 year's average issues. Replenishment quantities shall be adjusted to the nearest case unit, except when such adjustment would exceed 2 months' average issues.
5. Suitable modification of the foregoing procedure should be made in the case of stores subject to rapid deterioration.

Both the medical supply depots have by reason of the emergency been expanded by adding medical supply storehouses to their existing facilities.

At Brooklyn, they operate subsidiary storehouses at Newport, R. I.; Norfolk, Va.; Charleston, S. C.; and New Orleans, La.

San Francisco depot operates storehouses at Seattle, Wash.; Long Beach, Calif.; and San Diego, Calif.

The *Manual* of the Medical Department prescribes the routine for requisitioning material from depots. This is basic. For the emergency certain modifications of the prescribed routine are in effect. Briefly, practically all overseas activities, ashore and afloat, are replenished through the storehouse system and under reg-

ulations and routines as prescribed by area commanders.

Within the United States, activities ashore and afloat use the NMS Form 4 requisition (7 copies) system, submitting requisitions direct to Brooklyn or San Francisco as location dictates, except in emergencies when local storehouse if existing, may be utilized.

Wartime expansion may severely tax the capacities of all procurement agencies. Delays in delivery of materials to the depots, even when high priority ratings are assigned, can frequently necessitate reduction in quantities requisitioned or *transfer requisitions*. The failure or inability of some contractors to meet specifications may result in rejection of materials and another waiting period results.

At all times medical department units ashore and afloat can lessen the interval between the date of a requisition and that of receipt of items by careful observance of the following points:

1. By preparing S. D. requisitions in accordance with the references listed above.

2. By paying attention to the necessity of indicating the type and voltage of electric current, proper identification of parts (when required) and the identification of the unit or apparatus, serial numbers, etc., for which the parts are required.

3. By limiting "emergency" requisitions to items and quantities required *immediately* to meet needs until regular or replenishment S. D. requisitions are submitted, particularly when air mail, air express, railway express or other costly method of shipment is required.

4. Bearing in mind transportation difficulties, congestion, and delays, whenever possible units should submit S. D. requisitions well in advance of overhaul or "in port" periods.

5. When possible, replenishment S. D. requisitions should be submitted not less than 2 months in advance of the time material is required, due allowance being made for transit time. If at the time the requisitions are prepared, certain items are desired at an early date, those items should be listed in a *separate requisition* and an appropriate comment made under "remarks."

6. Requisitions for material such as beds, chairs, bedside lockers, mattresses, overbed tables, X-ray units, and similar major items required to outfit or expand shore stations should be submitted at the earliest possible date and bear a statement as to the tentative date material is desired or *can be received.*

7. Despatch or letter inquiry relative to prospective shipment of material should be limited to *urgently necessary* items. When such communication cannot be avoided, care should be observed to accurately identify the *proper name of the ship or station,* the *S. D. requisition number and date,* the *item number, stock number,* and the *name of the material.*

CONCLUSION

An attempt has been made to cover the most salient functions of the medical officer ashore and afloat. The efficient discharge of the obligations and the ability to deal with the many problems that present themselves from time to time will depend on the individual medical officer.

It must be remembered that in every sphere of the Medical Department the welfare of the group is its primary consideration. The need of the individual is of secondary importance. The service demands a radical readjustment and, in many instances, actual sacrifice of physical, financial, and domestic considerations. Individual inconveniences, except in unusual instances, cannot be given the same consideration as the needs of the groups.

This should not be interpreted as implying that a lower standard of treatment is condoned. These are individual problems that devolves on the medical officer in the discharge of his duties. In this respect he must be able to maintain a balance between undue leniency and undue harshness. Those individuals who are ill should be given the benefit of all possible treatment. It should not be forgotten that individuals with functional or psychogenic disorders may be just as sick and disabled as those with organic illness and that they are entitled to as much consideration. However, while carrying out their responsibility of treating patients, medical officers should not lose sight of their important role in the prevention of ill-

ness and disability. The conservation of manpower is one of the basic missions of the medical department.

The objective of naval medicine is in some ways different from that of civilian practice. The training and experience of practicing civilian doctors has conditioned them to do everything possible to benefit their individual patients. Except in medicolegal practice there has been little need to consider the welfare of society in making decisions and recommendations. In naval medicine, the action dictated by consideration of the welfare of the individual patient, is often the same as that which must be taken in the best interest of the Navy. There are instances, however, where this is not true. An aircraft carrier is not the ideal environment for someone who has just recovered from an anxiety state incurred in combat, but military necessity demands that such an individual be returned to that assignment when he is capable of it.

Section II

FUNCTIONS OF DENTAL OFFICERS

INTRODUCTION

This section of the course has two purposes: (1) To provide a resumè of the descriptions of various types of dental activities which have been described in detail before, and to outline those activities which have had little or no previous discussion; and (2) to indicate the types of duties and responsibilities routinely assigned to dental officers at each type of activity.

To accomplish these aims in a logical manner, and to give a clear picture of the relative position of each type of activity within its chain of command, the material in this section has been divided into four chapters.

Chapter 19, which concerns itself with officers assigned to duty within the Navy Department, gives a brief history of the Dental Corps within this activity, and contains a brief review of the duties of dental officers assigned to the various offices in the Department.

Chapter 20 describes the various types of duties assigned to dental officers within naval districts. This comprises the functions of the regional dental inspector, the district dental officer and other staff dental officers. It also includes the service obligations of the commanding officer of a naval or marine dental activity, the head of the dental department of a naval station and the assistant dental officers attached thereto.

Chapter 21 is similar in scope to chapter 20, except that emphasis is placed on duties with fleet-based units rather than shore-based activities.

Chapter 22 departs from the foregoing types of study in that a few of the specialized functions which are assigned to dental officers and the various specialties and rating groups new in effect among enlisted dental personnel are described. Also included is a brief discussion of naval dental technicians schools and their functions. It is expected that this chapter will enable a dental officer to estimate the help he will require from enlisted assistants of the various categories, and thus serve as a guide in setting up training programs.

This section, together with previous discourses of dental duty assignments, will provide the dental officer with a picture of the role of the Dental Corps in the Navy, and the types of duties and responsibilities which may be expected in the various duty assignments.

CHAPTER 19

FUNCTIONS OF DENTAL OFFICERS WITHIN THE HIGHER ECHELONS OF AUTHORITY

HISTORY OF DENTAL DIVISION, BUREAU OF MEDICINE AND SURGERY

The functions of the dental segment of an organization as large and as complex as the U. S. Navy are, obviously, varied.

The correlation of these varied dental functions and those of the many other services within the Navy is a complicated task requiring an efficient organization and effective leadership.

Responsibility for directing the dental program, and making it an integral part of the Navy's over-all logistic goals, rests with those men assigned to one section of the Navy Department—the Dental Division of the Bureau of Medicine and Surgery.

When the first group of dental officers reported for duty, shortly after a Dental Corps was authorized by Congress on 22 August 1912, the number of such officers was relatively small. Responsibility for the assignment of these officers, and related administrative duties, was therefore absorbed by the existing organization within the Bureau of Medicine and surgery.

As the size of the Dental Corps increased, and as the scope of its responsibility expanded, it became apparent that the Bureau, in order to utilize effectively dental personnel and material, required the assistance of technicians who were familiar with the problems peculiar to the dental profession. This need became increasingly important during the rapid expansion of the Dental Corps during World War I.

In order to meet this need, Dr. William N. Cogan was appointed in 1918 as the first dental officer to serve as an assistant to the Personnel Officer in the Bureau of Medicine and Surgery. In the following year, Dr. Cogan was relieved by Dr. Harry E. Harvey who held the post until May of 1922.

In 1923 the Bureau of Medicine and Surgery revised its internal organization to provide for a Dental Division with an officer of the Dental Corps as its head. This permitted dental officers a greater voice in the administration of their corps, but the dental service remained an integral part of the Navy's medical service and dental activities in the field were considered segments of the associated medical units.

During World War II, the Dental Corps expanded to a force of 7,000 officers. This growth was matched by a corresponding increase in the number of enlisted personnel designated as dental assistants. This large force of specialized personnel taxed the existing administrative organization.

Recognizing the need for an administrative organization which could more readily carry out the Navy's greatly expanded dental program, the Surgeon General, in May 1945, established the office of Assistant for Dentistry within the Bureau of Medicine and Surgery. This called for a complete reorganization of all dental functions within the Bureau.

The major provisions of this reorganization were incorporated into a legislative bill which, when passed on 28 December 1945, became Public Law 284. This law, however, did not become effective until 28 June 1946.

On 20 August 1946, the Surgeon General issued a directive which incorporated the provisions of Public Law 284 and provided for a reorganization of the Dental Division in substantially the same form as it is today, an autonomous unit of the Bureau of Medicine and Surgery.

In March 1947 the office of General Inspector was established in the Bureau of Medicine and Surgery.

Under the reorganization, Rear Admiral Alexander G. Lyle became the first dental of-

ficer to serve as Assistant Chief of the Bureau for Dentistry, and Rear Admiral Alfred W. Chandler became the first dental officer to serve as Chief of the Dental Division. Later Admiral Lyle was designated as the General Inspector of the dental service while Admiral Chandler assumed the position of Assistant Chief of Bureau for Dentistry, and in addition retained the position and title of Chief of the Dental Division. At this time it was also decided that the officer of the Dental Corps next in rank on duty in the Dental Division should be designated Deputy Chief of the Dental Division. Early in 1948, the duties of Assistant Chief of Bureau for Dentistry and Chief of the Dental Division were assumed by Rear Admiral Clemens V. Rault.

The Dental Corps has made great strides since its inception in 1912. The first law provided for only thirty dental officers, with no provision for promotion beyond the rank of lieutenant (junior grade). At present, the dental service requires a large force of dental officers on active duty, plus many more in the inactive reserve. Much higher ranks may now be attained since the present law provides that one-half of one percent of the Dental Corps may be of flag rank.

As a further comparison of the status presently enjoyed by the Dental Corps, the administration of dental personnel in the period following 1912 rested solely with the Medical Department. Today, the Dental Division supervises all dental personnel and administers its own program, although it remains a part of, and utilizes many of the administrative facilities of, the Bureau of Medicine and Surgery.

GENERAL INSPECTOR, DENTAL

The General Inspector, Dental, is a flag officer of the Dental Corps assigned to the staff of the Surgeon General. He cooperates fully with the Dental Division, and with other divisions of the Bureau of Medicine and Surgery in carrying out tasks assigned to him by the Surgeon General.

The over-all duties of the General Inspector, Dental, are to plan, coordinate and direct the inspection program for the dental service. Specifically, he (1) conducts special inspections and investigations, as necessary, and prepares reports of same; (2) reviews, appraises, and makes recommendations on all inspection reports submitted by district dental officers and dental inspectors; (3) informs the Surgeon General and the Assistant Chief of Bureau for Dentistry of matters which require immediate attention as a result of inspections or investigations; and (4) maintains liaison with the Office of the Naval Inspector General and the General Inspector, Medical.

DENTAL DIVISION, BUREAU OF MEDICINE AND SURGERY

MISSION.

The mission of the Dental Division has been expressed in many ways; but, put concisely, its mission is to keep the greatest number of personnel ready for duty at all times.

The achievement of this mission calls for the effective and intelligent use of all the men and materials at the disposal of the Corps. In peace and in war it must maintain high standards of dental care for the thousands of widely dispersed facilities required to meet the Navy's global commitments. At a moment's notice it must be prepared to procure and distribute supplies and equipment suitable for a small advance field unit with the Marines, or for a well-equipped facility aboard ship or at a shore station. It administers training and research centers where new dental techniques are constantly being developed and perfected. Finally, it is responsible for formulation of an over-all policy for the Dental Corps which will conform to the over-all policy of the Navy.

ORGANIZATION.

Chief of the Dental Division.—The officer in charge of the Dental Division, known as the Assistant Chief of the Bureau of Dentistry and Chief of the Dental Division, holds the rank of rear admiral and serves for an indefinite period, until reassigned or retired. He is appointed to his post by the Surgeon General. As the highest dental authority in the Navy, it is his function to keep officials in the Bureau of Medicine and Surgery and the Navy Department informed of the status and needs of the Dental Corps and to make decisions regarding important policy matters.

Deputy Chief of the Dental Division.—Supervision of various naval dental activities is

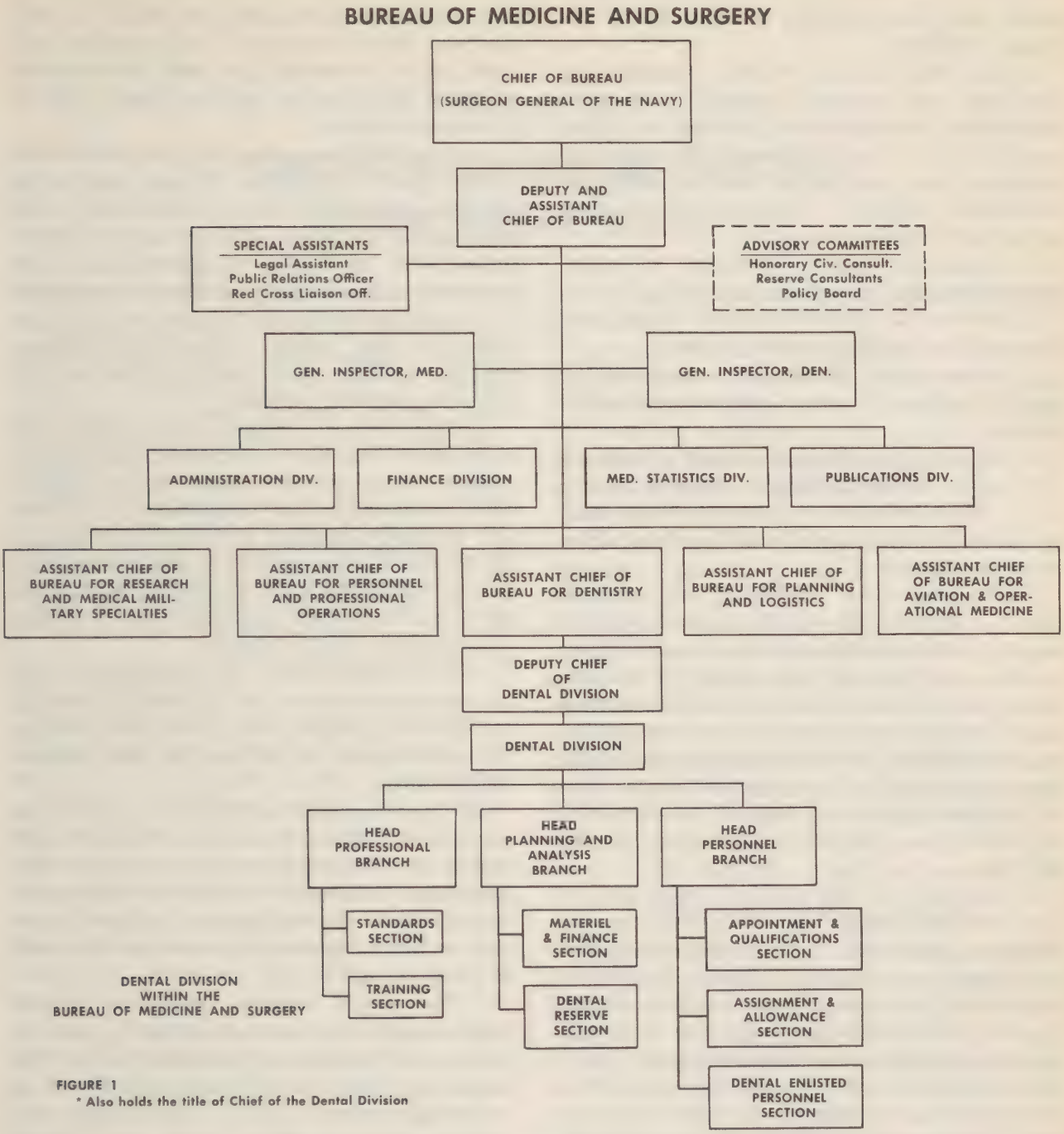


Figure 44.—Organization chart, Dental Division within the Bureau of Medicine and Surgery.

the special concern of the Deputy Chief of the Dental Division, the officer next in line, who also is responsible for disseminating information regarding division policy to dental personnel in the field and for proper execution of such policy.

Heads of branches of the Dental Division.— The Dental Division is divided, according to function, into three branches: the professional branch; the inspection, planning and analysis branch; and the personnel branch. The head of each of these branches is a senior dental

officer who is responsible to the Chief of the Dental Division.

1. The *professional branch,* consisting of standards and training sections, formulates professional standards and policies for dental practice at all naval facilities. It develops, administers, and coordinates training programs for dental personnel. This branch also performs the following duties:

a. Issues instructions necessary to ensure proper execution of existing policies.

b. Reviews all statistical dental reports and proposals for dental research projects.

c. Recommends officers for assignment to special training courses at civilian and service schools.

d. Reviews requests and makes recommendations for the assignment of enlisted personnel to dental technical training, in cooperation with the Hospital corps (dental) section of the personnel branch.

2. The *inspection, planning and analysis branch* is responsible for the maintenance and improvement of dental policies and standards; conducts surveys and inspections of the efficiency and economy of such standards; advises on all matters pertaining to the procurement and distribution of dental supplies and equipment, and to finance; and coordinates the Dental Reserve program as part of the Naval Reserve program. This branch is divided into two sections:

a. The *materiel and finance section* acts as the Division's supply department. It sets the standards for procurement, and distributes and maintains dental materiel suitable for use in all parts of the world. It also reviews and fits into the Division's budget estimates of the annual requisitions and purchase requests; maintains liaison with the Bureau's Finance Division regarding availability of funds; provides dental representatives for the Federal Specifications Board and for similar bodies when matters relating to naval dental materiel or services are under discussion; and supplies technical advice regarding the best arrangement of space for a dental service aboard ship or at a shore station.

b. The *dental reserve section* administers the Dental Reserve program. It puts into effect measures designed to improve the value of the program to the Navy and maintains constant liaison with the Bureau of Medicine and Surgery and other units of the Navy Department, with other military agencies, and with civilian groups, so that policies of the Dental Reserve program will be integrated with the over-all plans for national defense.

3. The *personnel branch* is concerned with all matters relating to manpower. This branch makes recommendations regarding the procurement, promotion, and assignment of officers and enlisted personnel to dental activities in the Navy. It keeps records on the professional and service ability of all personnel, and assigns the "right" man to a particular job. There are three sections in this branch:

a. The *appointment and qualifications section* maintains service and professional records for all dental officers, and recommends officers for appointment to the Regular and Reserve Dental Corps.

b. The *assignment and allowance section* assigns dental officers to naval facilities. It must choose the man, the place, and the time for a particular assignment, taking into consideration the over-all requirements of the Bureau and the Navy Department, as well as the needs of the Division.

c. The *dental enlisted personnel section* makes recommendations regarding the procurement, classification, and assignment of enlisted dental personnel. It maintains records of all enlisted personnel in the Corps as well as a modern personnel record system and a dental personnel statistical service.

CHAPTER 20

FUNCTIONS OF DENTAL OFFICERS WITHIN NAVAL DISTRICTS

REGIONAL INSPECTORS FOR DENTAL ACTIVITIES

Regional inspectors for dental activities are officers of the Dental Corps assigned by the Bureau of Medicine and Surgery to conduct inspections of dental facilities within specified areas in cooperation with local area commanders.

Though these officers do function within naval districts, and some may be assigned additional duty as members of the staffs of sea frontier commanders, their primary duty is to represent the Bureau in all matters pertaining to dentistry. Additional duty assignments may not conflict with their responsibility as Bureau representatives.

These officers not only conduct inspections of their own, but cooperate with district inspectors and advise commanders of the regions regarding professional, technical and administrative matters within the region.

They are also called upon to study and evaluate reports of inspections conducted by others, to review war and postwar plans as they affect the dental service, and to make such recommendations connected therewith as may be necessary.

Functions of these officers are covered more fully under *Medical Department Administration* in the chapter, "Technical and Management Control in the Shore Establishment."

DISTRICT DENTAL OFFICER

The Navy Department, through its various bureaus, is capable of formulating and interpreting official policy and of maintaining general supervision over the Navy as a whole; but to ask it to directly supervise the various organizations in the field would be too much. The Navy is too large and far too complex for such direct supervision by its main administrative units.

Instead, the Navy is divided into many segments known as naval districts, river commands, sea frontiers, fleets, forces, etc. Each of the above segments is composed of several commands. These commands vary in type, but all are subject to the same general local problems.

The administrative organization of a naval district is similar to that of the segments of the Navy.

District dental officers are officers of the Dental Corps assigned to the staff of the commandants of naval districts and of the river commands. These officers advise the commandants on matters concerning dentistry and correlate the activities of dental facilities within their respective districts. The functions of the district dental officer are fully discussed under *Medical Department Administration* in the chapter "District Officers and Sea Frontier."

OTHER STAFF DENTAL OFFICERS

Flag officers of the line often maintain staffs composed of officers of the various corps, including officers of the Dental Corps. The primary duty of such staff dental officers serving in these commands are very similar to those of a district dental officer in that they advise the flag officer regarding matters pertaining to dentistry. Specific instructions for officers assigned to such staffs will be provided by the command and by the Bureau of Medicine and Surgery.

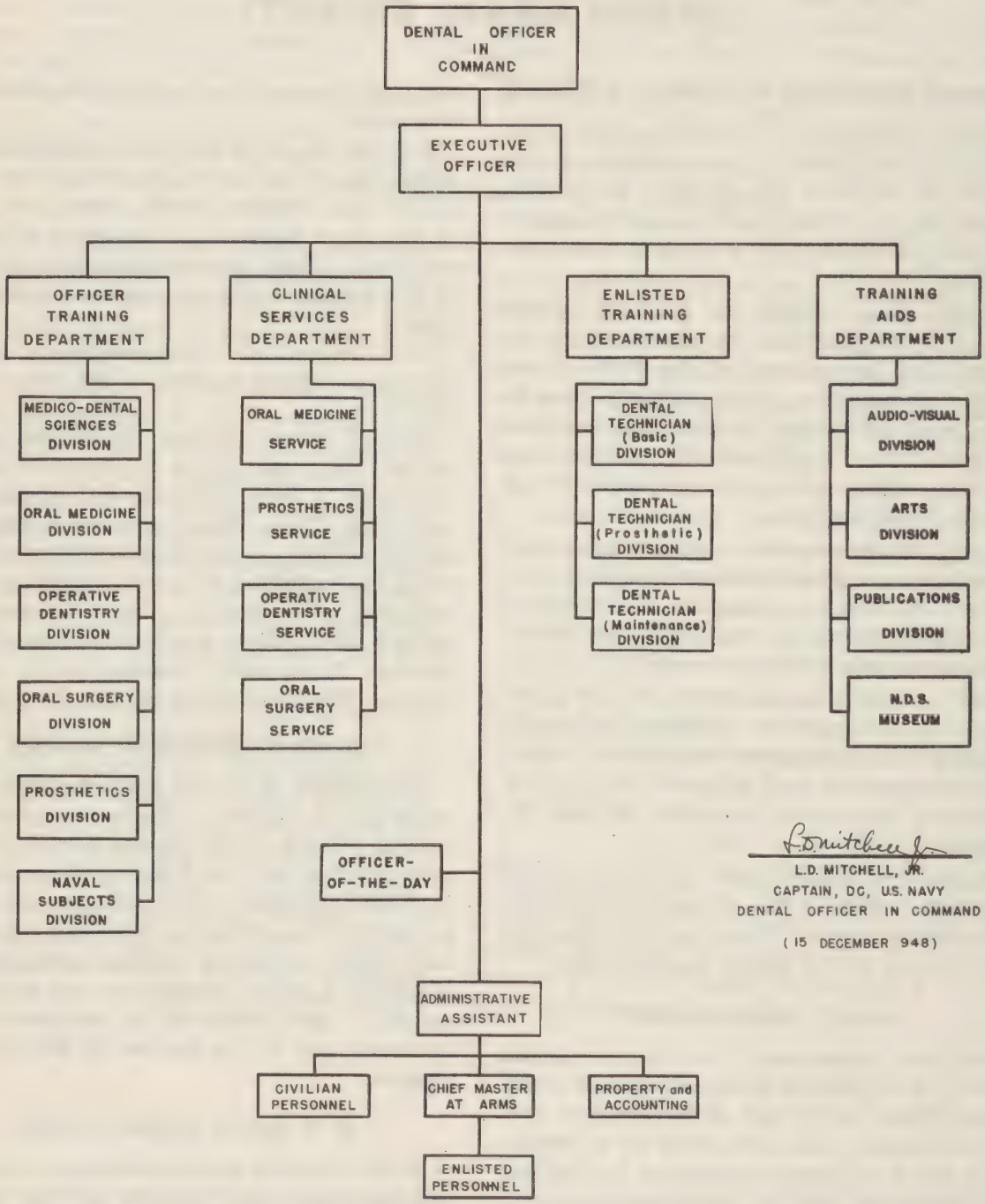
U. S. NAVAL DENTAL SCHOOL

At the time this course was prepared (1949), the Navy maintained but one activity officially designated as a U. S. Naval Dental School. This

ORGANIZATION CHART

(REVISED, 15 DECEMBER 1948)

U. S. NAVAL DENTAL SCHOOL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND



L.D. MITCHELL, JR.
CAPTAIN, DC, U.S. NAVY
DENTAL OFFICER IN COMMAND
(15 DECEMBER 948)

Figure 45.—Organization chart (revised December 1948), U. S. Naval Dental School, NMMC, Bethesda, Maryland.

activity was one of the commands located within the National Naval Medical Center at Bethesda, Maryland.

MISSION.

The functions of this command are many and complex, but may be summarized as follows:

1. To provide indoctrination and advanced instruction and training of officers of the Dental Corps of the U. S. Navy and of the Naval Reserve.

2. To provide basic instruction and training of enlisted personnel to qualify them for assignment to the dental technicians' rating group (class "A" naval school).

3. To provide instruction and training of enlisted dental technicians to qualify them for designation as dental technicians, prosthetic (class "C" naval school).

4. To provide instruction and training of enlisted dental technicians to qualify them for designation as dental technicians, repair (class "C" naval school).

5. To prepare such training aids, manuals, handbooks, and publications for the use of naval dental personnel as may be appropriate, when authorized or directed by competent authority.

6. To provide clinical dental services for all units of the National Naval Medical Center, including patients hospitalized in the U. S. Naval Hospital; and for such other patients as may be authorized.

7. To undertake such other appropriate functions as may be authorized or directed by competent authority.

ORGANIZATION.

In order to provide specific responsibility and to carry out these foregoing missions efficiently, the school is divided into four major departments: officer training department, clinical services department, enlisted training department, and training aids department.

The duties and responsibilities of each department, and the manner in which they are

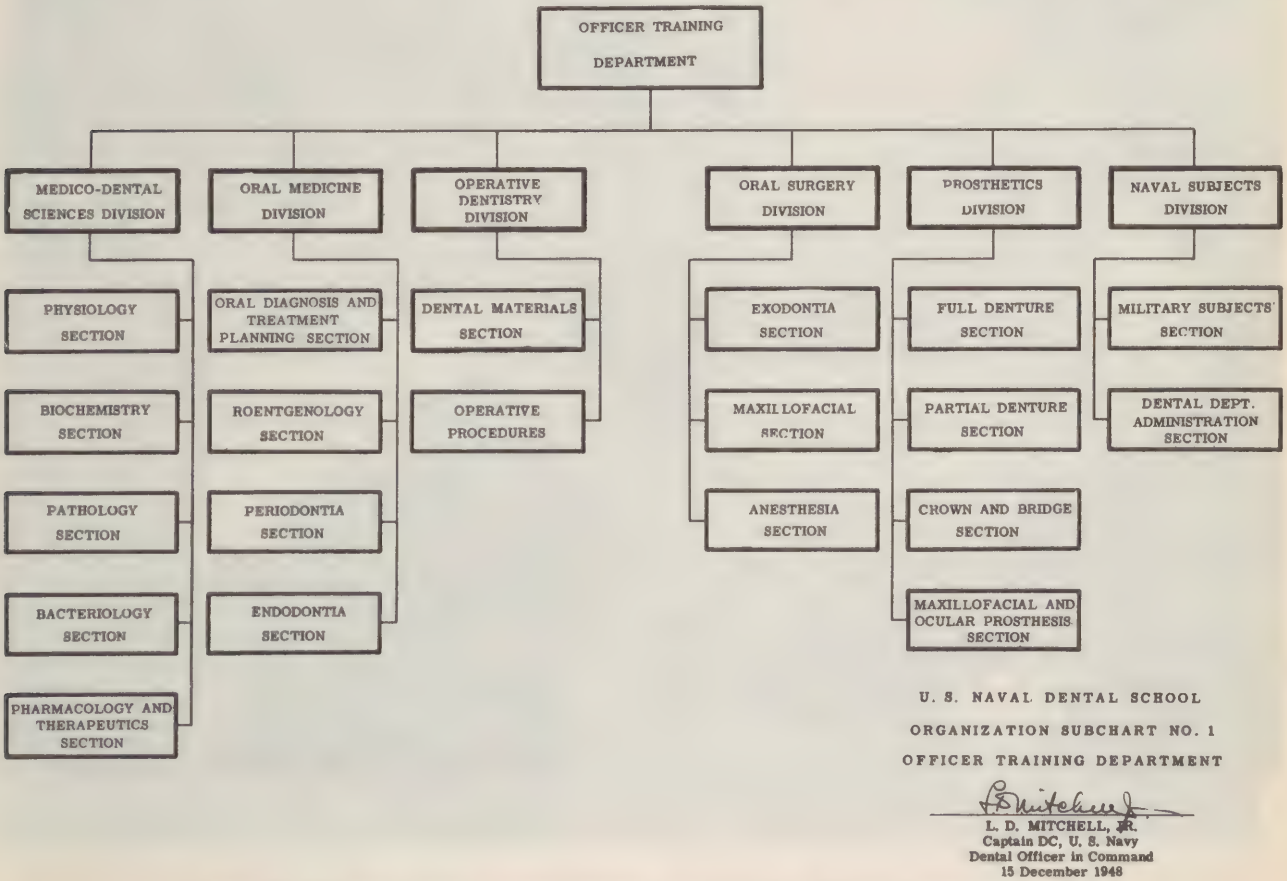


Figure 46.—U. S. Naval Dental School—organization subchart No. 1—officer training department.



Figure 47.—Officer training in ocular prosthesis.

to be coordinated, are determined by the dental officer in command, and promulgated in a written organization and standing order publication.

Each department is placed under a department head who is responsible to the commanding officer for the manner in which his department carries out its assigned tasks. Each department, in its turn, is subdivided into sections; each section under the supervision of an officer who is responsible to the head of department for the operating efficiency of his section.

Officer training department.—The officer training department is divided into six sections, which are again divided into subsections, in order to systematize the training of dental officers in a variety of professional and military subjects. This division is indicated in figure 46.

The head of the officer training department, known as the director of officer training, is in general charge of all training programs and courses of instruction for dental officers assigned to the school for duty under instruction. He is also responsible for the preparation, handling and custody of records of such courses of instruction.

In order to establish a well-balanced training program, senior officers of this department prepare detailed plans and prospective uses of courses of instruction to be submitted to the director of officer training for approval and coordination. The director of officer training, after making such adjustments as he considers necessary, submits the program to the dental officer in command for approval. This system assures a training program in which dental officers will receive detailed instruction in a wide range of subjects, which will supplement one another.

In order to assure a well-balanced training program, the director of training is required to collaborate with the director of clinical services



Figure 48.—Oral surgery seminar for post graduate students.

in order to obtain appropriate clinical cases for demonstration and teaching purposes, and to coordinate the teaching programs with the clinical assignments of officers under instruction. He is also called upon to cooperate fully with the director of training aids in the preparation and use of various training aids.

In order to provide the best possible dental service to the personnel of those commands which are authorized to receive treatment at the school, the director of clinical services is called upon to prepare plans for an efficient system of utilizing the facilities available to the best advantage. The director of clinical services is also called upon to consult with the heads of the various departments within the school and with the commands which received dental treatment from the school. For example, he is required to cooperate with the director of officer training in order to provide clinical cases and to coordinate the students' clinical experience with their training program. He is also called upon to consult with the staff of the Naval Hospital in regard to the diagnosis, treatment, and records of hospital patients referred to the school for dental treatment.

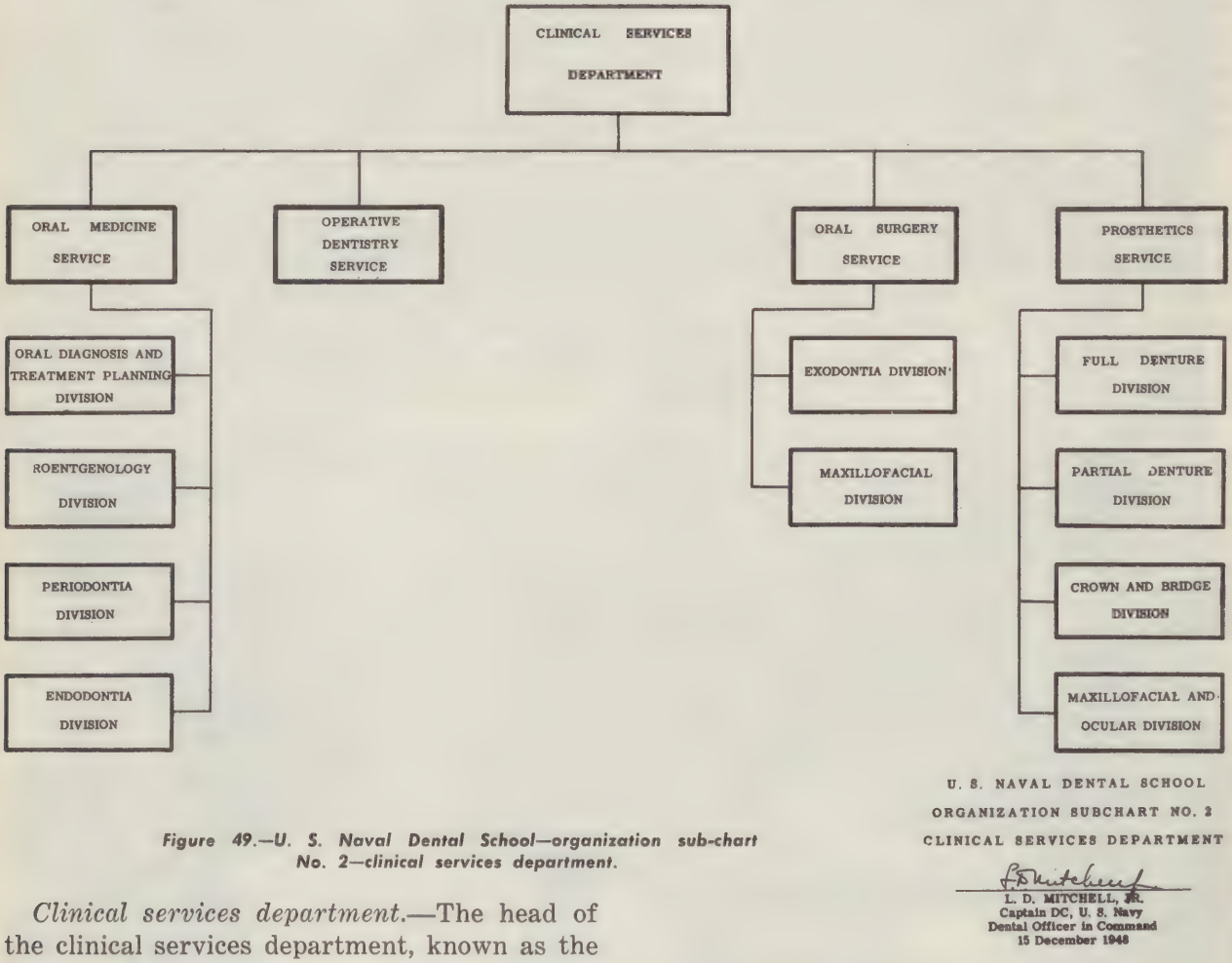


Figure 49.—U. S. Naval Dental School—organization sub-chart No. 2—clinical services department.

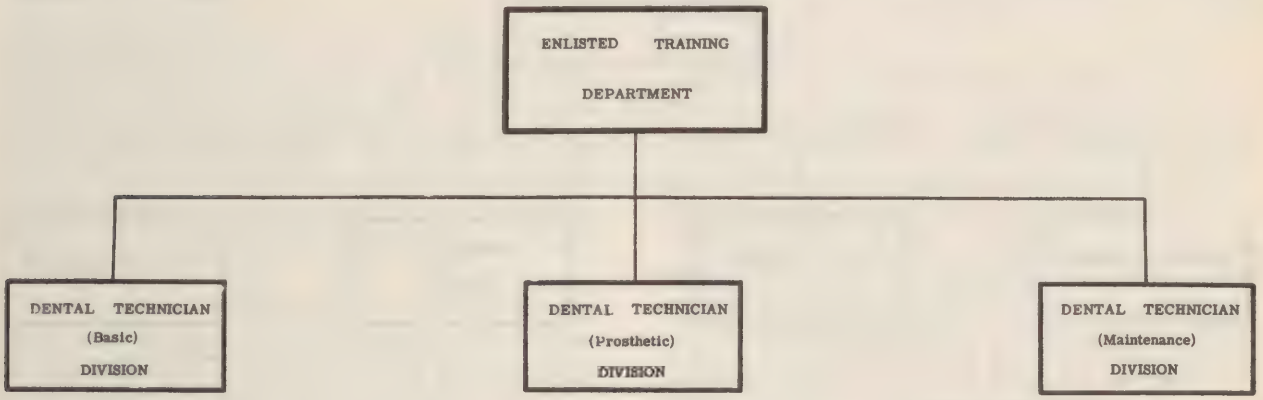
Clinical services department.—The head of the clinical services department, known as the director of clinical services, is responsible for coordinating all professional dental services rendered at the school, and is responsible to the commanding officer for the proper execution of such professional duties and for the proper preparation, handling, and custody of clinical records, reports, and correspondence regarding clinical matters.

This department is divided into four major sections: oral medicine service, operative dentistry service, oral surgery service, and prosthetics service, each of which is divided into subsections.

In order to give the director of clinical services the authority to supervise his department effectively, it is directed that any officer, whether on the staff or under instruction, must comply with the orders and instructions of the director while such officer is engaged in clinical activities, regardless of the regular duty assignment of the officer in question.

Enlisted training department.—The duties of the head of the enlisted training section, known as the director of enlisted training, are similar to those of the director of officer training, except that the training programs are for enlisted technicians.

The director of enlisted training is responsible for preparing a series of training programs which will best utilize the facilities available and which will provide each enlisted student with a well-rounded course of instruction in his chosen field. To accomplish this goal, the director of enlisted training must maintain constant liaison with the director of clinical services in order to procure suitable clinical cases for demonstration and training; and to coordinate the student's clinical assignments with the balance of his training program. Close liaison with the director of training aids must also be maintained to best utilize the various training aids



U. S. NAVAL DENTAL SCHOOL
ORGANIZATION SUBCHART NO. 3
ENLISTED TRAINING DEPARTMENT

L. D. MITCHELL, JR.
Captain DC, U. S. Navy
Dental Officer in Command
15 December 1948

Figure 50.—U. S. Naval Dental School—organizational subchart No. 3—enlisted training department.

The enlisted training department is divided into three sections in order to fit the training programs to the experience of the technicians under instruction. These subdivisions are:

1. Dental technician (basic) division — designed to provide general dental training to enlisted personnel with little or no previous dental experience.

2. Dental technician (prosthetic) division—designed to train general dental technicians in prosthetic procedures.

3. Dental technician (maintenance) division —designed to train general dental technicians in the art of maintaining and repairing dental equipment used by the Navy.

available, and to prepare newer training aids.

Training aids department.—The training aids department is that section of the school responsible for the production of all training aids such as photographs, lantern slides, motion pictures, posters, publications, scale models, etc. The director of training aids is responsible for the operation of this department.

To provide an efficient division of labor, this department is divided into four sections: The museum division, the arts division, the publications division, and the audio-visual division. The latter division is subdivided into a motion picture section and a photography section.

The director of training aids must maintain constant liaison with each of the various other departments within the school, and with many commands and activities in the near vicinity, to the end that an equitable system of issuing available training aids may operate, correction of any weaknesses or omissions in existing training aids may be made, new aids prepared, and assistance given to heads of the various departments in preparing training programs which will utilize existing or proposed training aids in the most effective manner.

which he has been assigned. For example, an officer whose primary duty is that of a member of the operative dentistry service within the clinical services department may be assigned additional duty as an instructor in the dental technician (basic) division of the enlisted training department. In this case, the officer would be responsible to the director of clinical services for his over-all performance of duty, yet he would be responsible to the director of enlisted training while actually serving as an instructor.

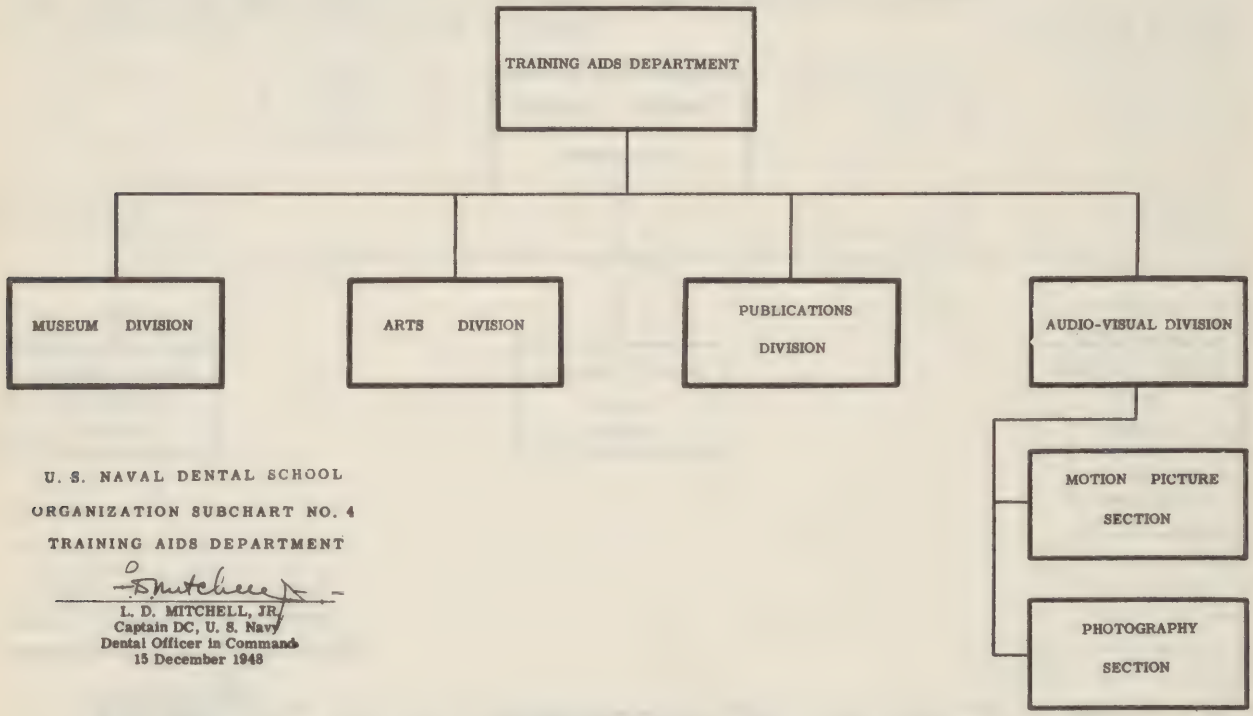


Figure 51.—U. S. Naval Dental School—organization subchart No. 4—training aids department.

This department also provides art work and photographs for use in the school's public relations program, for the Navy Department, and for other official agencies.

ASSIGNMENT OF DENTAL OFFICERS.

Dental officers assigned to this school, whether as staff members or students, are usually assigned primary duty within one of the foregoing departments. Each officer is thus chiefly responsible to the head of the department in which his primary duty lies. Many of these officers, however, are assigned collateral duties which fall outside the department to

By the same token, dental officers assigned to the school under instruction are generally responsible to the director of officer training, yet they are responsible to the director of clinical services while actually performing duty in the clinical offices.

Though each course at the school is designed to emphasize the specialty it seeks to teach, it also provides lectures and notes on military etiquette, administration, naval regulations and customs, naval law, and similar subjects. These lectures are designed to fit dentists as naval officers, in the belief that a thorough knowledge of naval customs and problems is desirable.

RESEARCH.

One project which is supported by the personnel of all sections, both staff and student, is that of research and clinical investigation. The commanding officers of the school encourages legitimate research projects and encourages personnel to contribute their time and talents to this end. To assure correlation of research efforts, a standing committee on research has been established. This committee directs research projects and makes arrangements with other commands for advise or assistance.

ADMINISTRATION.

The administration of the Naval Dental School is similar to that of any other dental command. The commanding officer is a senior officer of the Dental Corps. He determines the policy of the school and supervises its operation. He has the same authority and responsibility as the commanding officer of any naval command.

Some slight differences in administrative procedure, however, result from the fact that the Naval Dental School is one of several commands physically located within the National Naval Medical Center. These differences in administrative procedure are designed to coordinate the administrative functions of the various commands. Since these differences are slight, and are subject to change, they will not be discussed here. It is sufficient to note here that two or more commands operating in close harmony often cooperate in many of their administrative and logistic functions. Such variations from standard procedures, however, will always be set forth in local orders and supported by proper authority.

U. S. NAVAL DENTAL TECHNICIANS' SCHOOLS

Naval dental technicians' schools may be separate commands or be incorporated as a part of the dental department of a larger naval command. A school may appear as a separate activity within a central training command.

A dental technicians' school, regardless of its administrative organization, usually has two main goals: (1) To provide dental service for personnel coming under its jurisdiction; and (2) to train enlisted personnel in the subjects it has been authorized to teach.

The number of dental services rendered per staff member will obviously be far less in a dental technicians' school than in a dental facility which does not conduct an extensive training program.

In a dental technicians' school, many of the personnel engaged in the practice of dentistry will devote much of their time to training students. Students will not work as rapidly as experienced personnel, and will spend much of their time doing technic cases or attending lectures. Finally, much of the laboratory and dental office space will be devoted to training purposes, rather than utilized for a purely dental service.

An additional factor will be the need of a small force necessary to compile the grades of students, to make the various reports required from schools, and to make necessary entries on the personnel records of the students.

Some dental officers assigned to schools as instructors may be assigned to train senior enlisted assistants, while others may be asked to give basic instruction to incoming enlisted personnel who have had little or no previous dental training or experience.

Naval dental technicians' schools provide regular dental service in addition to its dental training program. Dental officers assigned to schools can therefor expect to continue the regular practice of dentistry while engaged in teaching others.

Since most dental technicians' schools are operated near, or in conjunction with, regular naval hospitals, officers assigned to these activities will have a greater opportunity to observe the more complicated dental cases which require hospitalization. As in other types of dental activities, these schools offer a wide range of opportunities for training to the individual dental officer.

U. S. NAVAL DENTAL CLINICS

A dental clinic, established under a dental commanding officer, has the same general logistic goal as does any dental facilitity—the maintenance of the dental health of those who come within its jurisdiction.

As in the case of any other dental facility, a Dental Clinic provides general operative, oral

surgical, and prosthetic dental services, though the size and extent of each of these services may vary from one command to another. The dental command has added responsibilities, however. The senior dental officer is no longer merely head of a department but is a commanding officer. As a commanding officer, he must assume responsibility for the operation of the unit as a command as well as for its operation as a dental facility. As a commanding officer, he is responsible directly to the commandant of his district and to the various bureaus within the Navy Department.

This added responsibility calls for a larger administrative force than would be necessary in a dental department on board ship or at a naval station in order to prepare the reports and returns required of any naval command.

As one example: the Bureau of Naval Personnel is charged with the responsibility of allocating all personnel in the Navy and maintaining an accurate record of their assignment. In order to accomplish this, an elaborate personnel accounting system has been placed in effect throughout the Navy. Under this system, each command must make a daily report of the changes which occur in its personnel. These reports are collected in central offices and compiled on I.B.M. cards in order to provide a rapid and accurate picture of the Navy's personnel strength and distribution.

The dental department of a ship or station need not concern itself with submitting this report since it is prepared and submitted by the station personnel office. The dental command, however, must prepare and submit these reports in the same manner as a line command, or a command of any of the other staff corps.

Another factor in increasing the size of the administrative staff at a dental command is the need of caring for the personnel records of its staff and for any transient personnel who may come under its jurisdiction. Here, again, is a task which may be ignored by a dental department, but a dental command must issue its own orders for its personnel, its own promotions and demotions, and carry out the various other personnel functions peculiar to a naval command.

Dental officers at a dental command, other than the commanding officer and executive officer, will not be greatly affected by administrative responsibilities. Most dental officers will continue to practice dentistry in the same manner as they would in a dental department since the bulk of the administrative chores will be performed by enlisted personnel under the supervision of an officer of the Medical Service Corps or Hospital Corps or under the supervision of a senior enlisted technician.

The collateral duties of dental officers at a dental command are apt to become more varied, however, as personnel for various boards and services must be drawn from their ranks within the command.

Officers assigned to dental commands who wish to qualify for more responsible administrative positions will be able to observe and learn the various functions performed by any naval command. They will also be able to observe the relative importance of the various dental and non-dental administrative procedures in the over-all naval picture.

DENTAL OFFICERS AT SHORE STATIONS (SHIPYARDS)

Although the duties of dental officers on board ships, with Marine Corps units, and at dental commands are very important, the greatest number of naval dental officers will probably be assigned duty at shore stations under the command of officers of line or of staff corps other than the Dental Corps.

The organization of the dental department will be about the same in each shore station of this type, whether within the United States or at an overseas base. We have selected a U. S. naval shipyard as an example.

THE YARD DENTAL OFFICER

The senior dental officer attached to a shipyard may be called the Yard Dental Officer, though officially his title will be the Dental Officer. As in the case of the dental officer on board ship, the yard dental officer is responsible directly to his commanding officer for the maintenance and operation of the dental department.

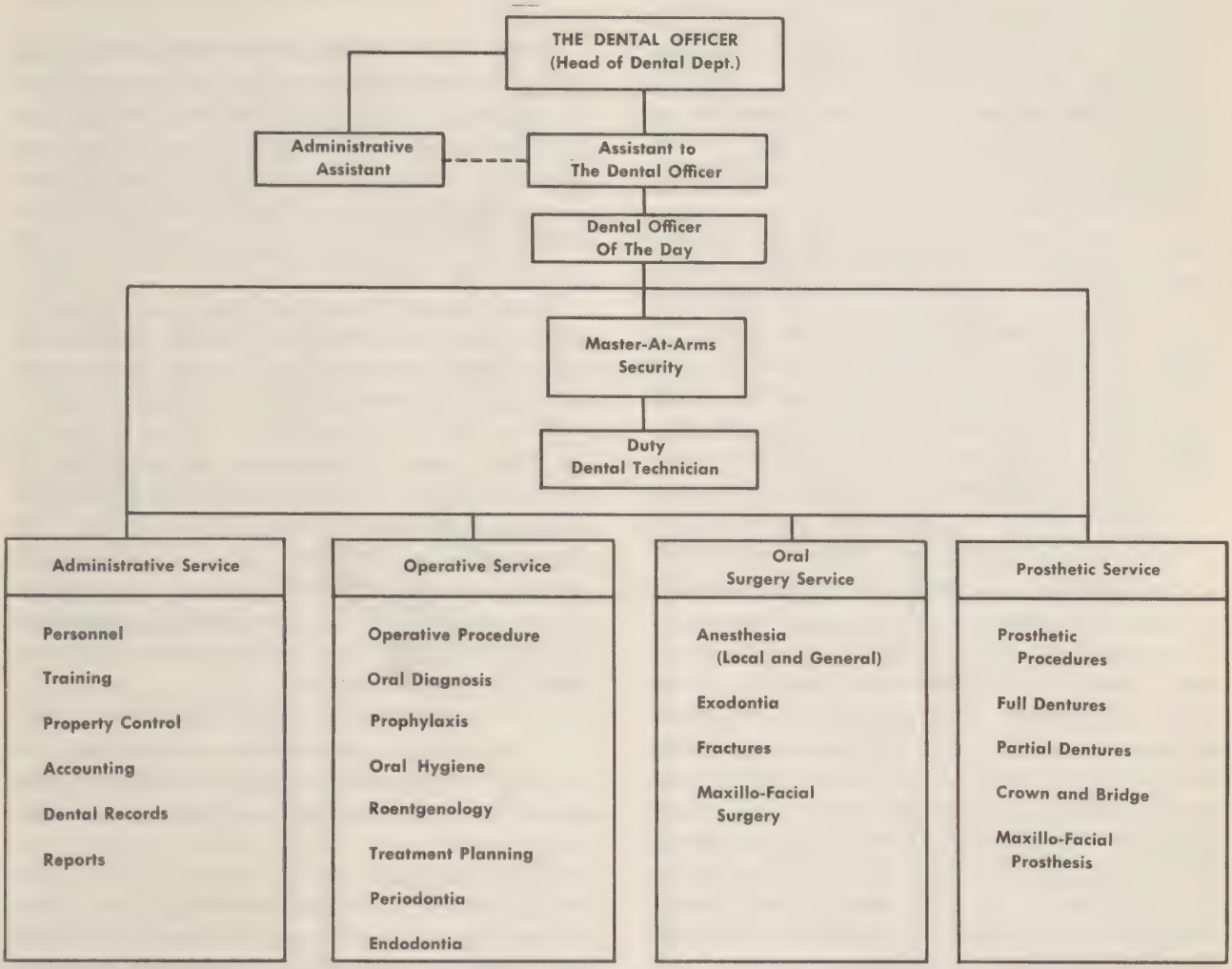
It is his duty to devise a plan of operation which will utilize available men and materials in the most efficient manner, to provide the most satisfactory dental service possible under local conditions, and to carry out matters

of naval policy as defined in directives of the Navy Department and as interpreted by his local commanding officer.

ORGANIZATION CHART.—An effective method for determining the most efficient means of assigning personnel and allocating available equipment and building space is that of preparing an organizational chart and adhering to it.

This chart should be reviewed at regular intervals and modified as necessary to account for changes in regulations or personnel allowances and to correct any deficiences which may present themselves.

The dental officer and the medical officer cooperate fully in providing an adequate dental and medical service for personnel dependent upon the facilities of the shipyard.



For administrative and professional purposes a typical Dental Department ashore may be divided into four services, namely: administrative, operative, surgical, and prosthetic, with each service in charge of a dental officer when practical.

Figure 52.—Typical organization of a dental department at a shore station.

In order to facilitate the dental care and treatment of crews aboard ships being overhauled in the yard, their commanding officers should be consulted by the yard dental officer as to an agreeable plan for making appointments. In this way cooperation will be assured.

When wounds or injuries of a dental nature are received by civil personnel while at work in a station, the yard dental officer renders necessary emergency professional assistance.

Such cases are treated, recorded, and reported in accordance with instructions contained in yard regulations, based upon directives issued by the Navy Department.

As head of the yard dental department, it is the dental officer's duty to advise his commanding officer, an officer of the line, regarding any factors which limit the quality or quantity of dental service, and to offer constructive suggestions regarding methods which will increase the value of the dental department to the command as a whole.

As a representative of the Dental Division of the Bureau of Medicine and Surgery, it also is his duty to advise higher echelons of authority regarding matters which might affect the dental program of the Navy as a whole. This might include information regarding faulty equipment or unsatisfactory supplies being furnished, or recommendations that new types of material be considered as possible additions to, or as substitutions for, standard items listed in the *Army-Navy Catalog of Medical Materiel.*

In submitting suggestions to higher echelons of authority, however, the dental officer should always outline his idea clearly and concisely, then route his correspondence via the official *chain of command.* This will give all interested parties a chance to study the recommendations and make appropriate comments. Failure to route correspondence properly can easily change a possible commendation into an almost certain reprimand. It most certainly will delay official consideration if the letter must be returned to one link in the *chain of command* for additional information or comment.

A dental officer who passively carries out instructions as they are handed down may serve his entire tour of duty without a reprimand, yet fail to fulfill all his responsibilities.

The dental department of a naval shipyard, as in most shore-based activities, is usually a compact unit. Its operating and administrative offices are usually contained in a single centrally located building, and are sometimes situated within the same building as the medical dispensary. The physical arrangement of a given dental department will undoubtedly vary from those of other commands depending on the nature of the available space and the scope of the services required. It is the responsibility of the yard dental officer to determine what arrangement would be the most suitable, and put the system into effect. Of course, any plan which would call for alterations in existing buildings must be approved by the commanding officer.

As a rule, such plans should first be discussed with the public works officer or an engineering officer to determine whether the changes could be made if approved. In many cases, any alteration in the structure of an existing building would weaken its construction to such an extent that desired changes would be impractical or too costly.

Since the primary mission of a dental department is to provide a dental service, let us see who is to render this service and who is eligible to receive it.

With but few exceptions, dental service in the Navy must be provided by an officer of the Dental Corps. It is often a great temptation to give capable and ambitious technicians an opportunity to learn and practice dental techniques, but it should be remembered that *patients are entitled to treatment by qualified dentists* and the Navy holds dental officers responsible for this service.

A few exceptions to this general rule are:

1. *Oral prophylaxis.*—This service may be rendered by qualified dental technicians, but should be supervised by an officer of the Dental Corps.

2. *Emergency dental treatment.*—This may be rendered by qualified members of the medical or dental departments when a Dental Officer is not available. Such treatment should be restricted to emergency measures, and the patient later referred to a dental officer. If the emergency dental treatment to be rendered by the dental technician is beyond his ability, he will immediately call the duty dental officer for assistance.

3. *Treatment at non-naval activities.*—When naval dental facilities are not available, naval personnel on active duty may obtain emergency dental treatment for non-naval activities.

Treatment by a civilian dentist may be authorized by competent authorities; but, in such cases, it is necessary to state that it was not practicable to obtain treatment by a dental activity of the Federal Government. Dental fa-

cilities of the other armed forces, the Public Health Service, and the Veterans' Administration are considered branches of the Federal Government and should be utilized where naval dental facilities are not available.

AVAILABILITY OF DENTAL TREATMENT

Dental professional services are authorized and available to the following personnel: (a) Personnel on the active lists of the Navy and Marine Corps; (b) personnel of the Fleet Naval and Fleet Marine Corps Reserve when on active duty; (c) personnel on the retired lists of the Navy and Marine Corps when on active duty; (d) personnel of the Naval Reserve and Marine Corps Reserve when on active duty; (e) personnel of the Army, Coast Guard, Coast and Geodetic Survey, and Public Health Service, to the extent covered by reciprocal agreements or when serving with the Navy under orders issued by competent authority; (f) personnel on the retired lists of the Navy and Marine Corps when not on active duty; (g) personnel of the Fleet Naval Reserve and the Fleet Marine Corps Reserve when not on active duty; (h) Civil personnel injured in a naval shore station; (i) Veterans' Administration patients when hospitalized in naval hospitals; (j) prisoners of war; and (k) such other persons as are hospitalized in naval hospitals in accordance with law. Priority in the rendering of dental treatment will be given to persons in categories (a), (b), (c), (d) and (e). Treatment of personnel of the Naval Reserve and Marine Corps Reserve when serving on training duty, and treatment of civil personnel injured in a naval shore station is limited to emergency measures.

Treatment of Veterans' Administration patients is limited to treatment adjunctive to medical treatment of the conditions for which they are hospitalized. Treatment of persons in category (k) is administered only as an adjunct to inpatient hospital care, and is limited to the care of injuries such as fractures of the mandible or maxilla and to the treatment of acute infections; it does not include prosthetic or routine operative treatment. Emergency dental treatment may be rendered to any person when such treatment is necessary and demanded by the laws of humanity or the principles of international courtesy. Payment for any dental service is prohibited.

Dental prosthetic treatment is furnished only in activities authorized to provide such treatment, except that minor repairs or adjustments to prostheses may be made. Dental prosthetic treatment is furnished, without prior approval of the Bureau of Medicine and Surgery in individual cases, to persons in categories (a), (b), (c), (d), (e), (f), and (g), as interpreted in the foreging paragraphs when such treatment is deemed to be necessary for the promotion of physical fitness or for esthetic reasons in exceptional circumstances. Dental prosthetic treatment may be furnished, without prior approval of the Bureau in individual cases, to Veterans' Administration patients hospitalized in naval hospitals when such treatment is clearly adjunctive to the medical treatment of the condition for which hospitalized. Dental prosthetic treatment is deemed necessary for the promotion of physical fitness, within the meaning of this term, only in cases involving the restoration of extensive loss of masticatory function or replacement of anterior teeth for esthetic reasons when lost as an incident of active service.

Prosthetic facilities are available in most naval shipyards to personnel authorized to receive such treatment. In activities having no dental prosthetic facilities, the dental officer should make direct arrangements, as regulated by local authority, with a convenient activity having such facilities. No arrangements are made for any patient until surgical, operative, and prophylactic treatment has been completed to such an extent as to obviate the need of any further attenion of this kind by the prosthetic facility.

A report of the dental prosthetic treatment rendered for patients is prepared by the dental officer of the activity furnishing such treatment, and forwarded to the Bureau of Medicine and Surgery. The Manual of the Medical Department contains detailed instructions regarding the preparation and submission of this report.

APPOINTMENT DESK CLERK

As the patient enters the dental activity his first contact will be with the information and



Figure 53.—Typical waiting room and appointment desk at a shore station.

appointment desk clerk, who is responsible for routing dental patients to the various offices.

When new patients request appointments, they are sent to the examining room for examination, where a clinic card showing the extent of work required is prepared.

The patient then returns to the appointment desk where he will either be given an immediate appointment if the need is urgent or be placed on the waiting list for a routine appointment at a future date.

Upon reporting for his appointment, the patient will receive his clinic card from the desk clerk who will route him to the office where he is to receive his treatment.

Other duties of the appointment desk clerk usually are:

1. Operate the switchboard.
2. Control the inter-communication system.
3. Operate the public address system, if such is available.
4. Furnish information concerning the dental department.

OPERATIVE SERVICE

The yard dental officer will appoint an officer of the Dental Corps as head of the operative service. This officer is in charge of all operative dentistry of the dental department. It is his duty to examine all patients on their first visit to the dental facility, make out a treatment chart in each case, order any X-rays he deems necessary, and read the developed negatives, before treatment is started.

Patients are then referred to the appointment desk for their first appointments if operative work only is indicated. If oral surgery or prosthetic treatment is indicated, patients are referred directly to the head of the service involved. All operative and surgical treatment must be accomplished before appointments for prosthetic treatment are granted.

All reappointments to the operative service should be made at the appointment desk.

Immediately following his final appointment, each patient should be reexamined to make certain that all work recorded on the treatment chart has been completed, that no new condi-



Figure 54.—Corridor—typical dental clinic.



Figure 55.—Dental department ashore—prophylaxis section.

tions or abnormalities are present in the mouth, and that all necessary entries have been made on the patient's individual dental record and on the clinic's records.

When this procedure has been accomplished, a statement to the effect that all necessary treatment has been completed should be made on the reverse side of the patient's treatment chart and signed by a dental officer.

Close contact should be maintained between the officer-in-charge of operative dentistry and his assistants. He should keep himself informed regarding events taking place in his service, and of the type, amount, and quality of work accomplished by each of his juniors. He, in turn, should keep the yard dental officer informed of all matters of importance concerning his service.

SURGICAL SERVICE

The yard dental officer will appoint an officer of the Dental Corps as head of the surgical service. This officer supervises, and is responsible for, all operations and treatments performed therein; and it is his duty to see that the strictest principles of sterilization, and all regulations governing the surgical service, are carried out. Normally, all surgery and extractions should only be performed in the surgical service. This service head consults with, and keeps the yard dental officer informed, of all matters of importance; and consults with the heads of other services of the dental department on matters that may concern them.

PROSTHETIC SERVICE

A dental officer is also appointed by the yard dental officer to head the prosthetic service. He



Figure 56.—Typical dental operating room—shore station.



Figure 57.—Typical prosthetic laboratory at a naval training station.

is responsible for all activities of this service and must keep himself fully informed regarding the policies of the yard dental officer, and be familiar with directives issued by the Bureau of Medicine and Surgery and other competent authorities. He should also consult with the heads of other services on matters that may concern them.

When a patient has been referred for prosthesis he should be examined by the head of the prosthetic service. The standard form which authorizes prosthetic treatment is prepared at this time in accordance with current directives. The patient is then assigned to an individual dental officer in the prosthetic service for treatment and that officer becomes responsible for designing and completing the necessary prosthetic appliances.

Any precious metal taken from a patient's mouth will be given to the patient if the metal was not supplied by the Government. Should the patient decline to accept the precious metal, it will be handled in accordance with current instructions for the disposition of precious metal scrap. An entry of the action taken in each case will be made in the dental record.

As each prosthetic case is completed, the individual report of prosthetic treatment must be filled out, signed by the patient and by the doctor who completed the case.

Before dismissing any patient, he should be examined by the head of the prosthetic service, who will assure himself that the work performed meets professional standards and that proper entries have been made in all records.

The prosthetic laboratory, under the general

supervision of the head of the prosthetic service, usually is managed by a specially trained hospital corps officer or chief petty officer. It is his duty to supervise the construction of prosthetic appliances, instruct junior technicians, maintain order and cleanliness, and collect precious metal sweepings and polishing dust residue. Precious metal dust and sweepings are disposed of in the same manner as precious metal scrap.

The yard dental officer will assign several dental officers to serve as members of a precious metal inventory board. At the end of each month, or as often as deemed necessary, they will hold a complete inventory of all precious metal on hand and submit their findings to the yard dental officer.

The manner in which the dental department is to be subdivided is a matter to be decided by the yard dental officer; the size of the dental department, the number of patients to be cared for, the types of service to be provided, the number and location of buildings housing dental facilities, and the logistic goal of the yard command are all factors which he will consider in making his decision.

X-RAY SECTION

The X-ray section of the operative and oral surgery service in the dental department of the average shipyard is relatively small. The equipment usually consists of a single dental X-ray unit, incorporated with the equipment of one of the regular operating rooms.

The X-ray room is usually situated in an office, such as the examining room, which is readily accessible to both the operative dental offices and the surgical offices. Local conditions will dictate the size of the X-ray equipment to be installed and its most suitable location.

DENTAL OFFICER OF THE DAY

As a general rule, every station requires that an officer of the Dental Corps stand a dental watch, though the scope of this watch varies from station to station.

In small stations, employing few officers of the Dental Corps, this watch may merely consist of a telephone watch. In larger stations, officers of the Dental Corps may be required to remain on duty at their offices until relieved. Where telephone watches are authorized, it is essential that the officer remain in the vicinity of his station and give the line officer-of-the-day a telephone number which will reach him immediately should any one require emergency dental care.

When telephone watches are not authorized, the dental officer-of-the-day will be required to remain within a certain area. Detailed instructions for standing such a watch will usually be prepared by the yard dental officer, approved by the commanding officer, and published to the members of the dental department.

LOG

Regardless of the manner in which officers of the Dental Corps will be asked to stand their respective watches, each dental activity will require that the dental officer-of-the-day make entries in the dental log.

This log is a continuous chronological record of the dental department. Here, the dental officer-of-the-day will record any changes in personnel, routine drills, convening and adjournment of special boards, visits of officers of flag rank and other dignitaries, inspections, and any events which might be of future interest as they take place during his tour of duty. On being relieved, the officer will sign the log and submit it to the yard dental officer for approval. This log will be similar to that maintained by the officer-of-the-day of a command.

It might be well to distinguish the difference between a dental officer-of-the-day and an officer-of-the-day since many men refer to all duty officers as O.D.'s.

The officer-of-the-day is designated by, and is the direct representative of, the commanding officer. In the absence of the commanding officer, the officer-of-the-day is responsible for the command as a unit. There is but one officer-of-the-day on duty at any one time. His aides, if any, are called assistant officers-of-the-day, or junior officers-of-the-day.

A dental officer-of-the-day, however, is the senior dental officer on watch. He is usually detailed by the yard dental officer, with the approval of the commanding officer.

The heads of the various other departments within a command (medical, supply, etc.) also

designate department officers-of-the-day, but each of these officers is subject to "the" officer-of-the-day designated by the commanding officer.

THE APPOINTMENT BOOK

An appointment book is provided for each dental officer. This book serves not only to record future appoints, but also has space for recording treatments performed on each patient, for keeping an alphabetical list of all patients and may serve as a complete professional log of the activities of the dental officer. Without such a log it would be impossible to prepare the reports required by the Bureau pertaining to the professional service rendered to patients.

STOREROOM

The size of the dental store room will vary greatly. Some small dental activities may use no more than a storage closet or cabinet. Larger units may have one or more rooms for the storing of supplies and equipment, supervised by a full time storeroom clerk who receives issues and accounts for all dental stores.

All dental stores should be taken directly to the storeroom as received, the shipping invoices verified, the stores placed on the shelves, and the charges entered in the proper ledgers before any items are issued to the various dental offices.

Each issue from the storeroom should be made on an approved issue voucher though the



Figure 58.—Typical storeroom arrangement in a dental department.

type and form of voucher may vary, depending on the size of the dental facility and the accounting procedures being used. By recording receipts and expenditures in the proper manner the storeroom keeper is able to determine the true rate of use of every item regularly used by the facility. This will enable him to prepare requisitions in time to ensure an adequate supply of materials, yet avoid waste of storage space or overstocking.

ADMINISTRATIVE SERVICE

The administrative service of a yard dental department will vary in size and organizational set-up, depending upon the size of the department and types of services rendered.

As a general rule, the administrative service is broken up into two general sections—personnel and property, under the supervision of an administrative assistant, usually an officer of the Medical Service Corps or Hospital Corps.

The personnel section prepares and forwards all official correspondence, forms and reports; disseminates information and official directives to other members of the department staff, and maintains the department correspondence files.

The property section is charged with the responsibility of procuring dental supplies, equipment and services; issuance of these items to the various offices in the dental department; accounting for all receipts and expenditures, and the preparation and submission of official financial reports and statements.

More detailed instructions regarding preparation and submission of the various reports prepared by the administrative service may be found in the chapter dealing with administration, forms and procedures.

The district dental officer can provide detailed information regarding the procedures to be followed by activities within his district.

MILITARY DUTIES

There are certain duties which officers of the Dental Corps must perform in addition to those which are specifically dental. These include serving on courts martial, boards of investigation and courts of inquiry. At some stations these officers may be asked to serve on committees related to the welfare of the crew, such as collecting for the Red Cross or Navy Relief, organizing athletic enterprises or supervising entertainment activities. Many of these special duties are discussed in the basic course and all officers are encouraged to become familiar with them.

HOSPITALS AND DISPENSARIES UNDER A MEDICAL OFFICER IN COMMAND

The senior dental officer attached for duty to a naval hospital or a dispensary having a medical officer in command is designated chief of the dental service. He has the same status in his relation to the commanding officer and to the executive officer, as other chiefs of services of the staff. His general duties and responsibilities are:

1. Acts in an advisory capacity to the commanding officer and to the executive officer in all matters relating to dentistry and the dental service.
2. Organizes the dental service in accordance with the precepts of modern scientific dentistry.
3. Conducts a program of training for all personnel on duty in the dental service in appropriate subjects.
4. Arranges regular meetings of the personnel of the dental service for thorough review and analysis of the clinical activities.
5. Participates in all staff meetings and requires such attendance of other personnel on duty in the dental service when necessary.
6. Provides dental treatment for dependents of naval personnel within the limitations of current instructions.
7. Guards the best interests of patients presenting diseased or traumatic conditions of the face, jaws, neck and oral cavity, who are referred to the dental service. Consults with officers of the Medical Corps when necessary. Supervises the activities of officers of the Nurse Corps assigned to the dental service.

DENTAL OFFICERS AT U. S. MARINE CORPS ACTIVITIES ASHORE

The U. S. Marine Corps, although maintaining a separate organization and wearing a distinctive uniform, is a component of the U. S. Navy and is provided medical and dental care by naval medical and dental officers and other members of the naval Medical Department.

Officers of the Dental Corps assigned to

Marine Corps activities, whether to a Marine post, camp, base, Fleet Marine Force or Division, will be subject to the regulation and orders of the Marine Command.

THE DENTAL OFFICER

Excluding the Fleet Marine Force, which is discussed elsewhere in this course, the senior dental officer of a Marine post, such as the Marine Activity, Quantico, Virginia, is also designated the commanding officer of the post dental detachment. He also may serve on the staff of the commanding general. He is directly responsible to the commanding general for all professional, technical and administrative matters relating to the dental service, and also recommends such transfers and employment of dental personnel and equipment as may be necessary for maximum utilization of the dental facilities.

In large established Marine Corps units the physical accommodations, and the organizational and professional functions of the dental departments are similar to the standards of naval shore activities.

The dental facilities of a Marine Corps unit varies. The dental department may be housed in a single structure or divided into two or more dental clinics distributed throughout the command. The latter system will more than likely be used in the larger establishments. In any case, the major portion of dental care will be accomplished at the main dental clinic usually centrally located in the command.

SENIOR ASSISTANT DENTAL OFFICER

The dental officer regularly attached to the dental detachment, next senior in rank to the commanding officer acts as the executive officer of the post dental detachment. In absence of the dental officer in command, the executive officer assumes command.

The executive dental officer, with the approval of the commanding officer of the dental detachment issues regulations and orders governing its detailed organization and functions of sufficient scope and detail to provide:

1. An orderly routine, satisfactory maintenance, and efficient utilization of dental facilities and personnel.

2. Adequate supervision and precaution for protection of patients.

3. Prompt and appropriate recording of diagnostic procedures, findings and treatment.

The executive dental officer is directly responsible to the dental officer in command for the supervision of all personnel attached to the dental detachment, the maintenance of liaison and cooperation with Medical Department personnel and the personnel of other post activities in order to integrate the dental service into the post routine.

Assistant dental officers are assigned duties in accordance with schedules published by the executive dental officer. Each officer will be furnished sufficient standard dental equipment and supplies to provide an adequate dental service for all eligible personnel. Dental officers' receiving such dental property are responsible for its maintenance and custody.

Dental technicians are detailed to duty in dental operating rooms under the direct supervision of an assistant dental officer, who is responsible for the maintenance of order and the observance of current instructions.

The details of professional procedures to a considerable extent are left to the skill, care and judgment of each assistant dental officer. However, in unusual and complicated cases, the senior dental or assistant senior dental officer usually is consulted. In conditions requiring medical care or treatment, patients are referred to the medical officer. Medical officers should be consulted freely by dental officers whenever any case requires medical care and, when it is necessary or advisable to admit a dental patient to a Medical Department ward, the ward medical officer will be so informed by the dental officer. The medical officer will also be informed of the course of treatment recommended for the patient during his stay in the ward. A clinical record sheet will be prepared by the dental officer, giving the diagnosis and diagnosis number (as listed in the Navy's official nomenclature), a history of the case, clinical findings, treatment prescribed, daily record of condition of the patient under treatment, and progress. Upon completion of the case, the medical officer will be informed and the terminated clinical record will be summarized and entered in the individual's health record.

All extractions and other surgery are per-

formed in the oral surgery unit set aside for that purpose.

Prosthetic dental treatment will be furnished only by the dental officers designated for this duty. Patients requiring this type of treatment are referred to the dental officer in charge of the prosthodontia division.

The primary duties of dental officers are to prevent and treat diseases and injuries of the jaw, teeth and closely adjacent structures. The professional services of dental officers are available to personnel of the active lists of the Navy and Marine Corps; retired personnel of the Navy and Marine Corps; personnel of the Fleet Naval Reserve; personnel of the Fleet Marine Corps Reserve and other eligible personnel as authorized by the *Manual of the Medical Department* and current directives. Such services are limited to those measures which will most effectively and economically preserve the teeth of the personnel to ensure physical fitness and well being.

Dental treatment for dependents of naval and Marine Corps personnel is administered only as an adjunct to in-patient hospital care. For humanitarian reasons it is anticipated that occasions may arise which will require the rendering of dental treatment in emergencies and also for the relief of pain for those not entitled to it by law. In such circumstances the necessary treatment will be given.

DENTAL OFFICER-OF-THE-DAY

A dental officer-of-the-day's duty list is prepared and published in the dental department by the executive dental officer. Each dental officer will stand a rotated watch after regular working hours. This tour of duty consists of 24 hours. He remains in charge until properly relieved. He is responsible for the security of the clinic, compliance with orders and maintenance of good order, and performs such detailed and routine duties as the dental officer may direct. The dental officer-of-the-day enters in the log of the dental detachment all pertinent circumstances and unusual occurrences during his tour of duty together with matters which require action by the dental officer in command.

ADMINISTRATIVE ASSISTANT

The administrative assistant to the dental officer may be an officer of the Medical Service Corps or the Hospital Corps. He coordinates the work of the various divisions or services of the dental department. He keeps the dental officer informed, and makes such recommendations as may be indicated, with respect to the effectiveness of administrative organization and management applicable to the dental department.

The administrative procedures in regard to correspondence, dental reports and returns, procurement of dental supplies and equipment and its accounting of, custody, etc., are accomplished in the same manner for naval activities as previously described in this course under the chapter on administration, forms and procedures, and as prescribed in the *Manual of the Medical Department* and current directives, except that correspondence from a naval detachment assigned to a Marine Corps activity must be modified, when necessary, to comply with Marine Corps directives.

SUMMATION

When dental officers serve with Marine Corps shore activities, particular attention should be given to making appointments with various activities at such time as the working schedule will permit. This is best accomplished by close liaison with the dental detachment's administrative assistant and the officer or sergeant nearest to the unit concerned and not through the high echelon.

This system eliminates much paper work and repetition. Any small or average sized dental activity can easily be over organized, which may lead to decreased efficiency. The administrative assistant is responsible for all routine once the policy is established, thus leaving highly specialized dental personnel to attend to the dental needs of their troops.

The functions of the naval dental officers on duty with the U. S. Marines does not essentially differ from duty with naval forces. The mission of the Dental Corps remains the same in both organizations, and funds, materiel and personnel are procured in the same manner in both instances.

CHAPTER 21

FUNCTIONS OF DENTAL OFFICERS WITH FLEET-BASED ACTIVITIES

STAFF DENTAL OFFICERS AFLOAT

ASSIGNMENT AND TITLE.—Dental officers of considerable naval experience are assigned in administrative capacity to the staffs of commanders in chief of fleets and commanders of major subdivisions of those fleets. Their appointment to this type of duty stems from the fact that they are familiar with the organization and general principles and procedures of the Navy, as well as with dental professional and technical matters. As staff dental officers they are charged with the responsibility of integrating the dental service into the over-all Navy functional and organizational pattern. In other words, such dental officers are concerned with much more than the purely theoretical and idealistic type of professional service.

The senior dental officer assigned to the staff of the commander in chief of a fleet is termed the *fleet dental officer*. This assignment may be the incumbent's only or primary billet, or it may be a duty additional to his principal one. The reasons for this will be brought out later in the discussion of the nature of the duties of dental officers on various staffs afloat.

The senior dental officer assigned to the staff of a major subdivision of the fleet, such as a type command (battleships-cruisers, submarine force, Air Force, destroyers, etc.), is called the *force dental officer*. The billet is usually an additional duty assignment for a senior officer regularly attached to a convenient unit of the force. An example is the dental officer of the Submarine Base, Pearl Harbor, with additional duty on the staff, Commander Submarine Force, Pacific. For reasons that will become apparent in the discussion of duties, dental officers are on the staffs of certain commanders exercising administrative control but not on those in operational control. That is to say, they are on the staffs of type as distinguished from tactical commanders.

It is evident that there is a great deal of flexibility in all such assignments. The commanders naturally are responsible for proper dental care of their personnel. However, professional and logistic responsibility is usually delegated to an officer of the Dental Corps.

A few officers served as staff dental officers afloat in World War I, but it was not until World War II that a reasonably standard organizational pattern was evolved. The impetus was primarily given by the widespread need for extensive dental service with its attendant personnel, facility, and supply problems in the Pacific and Atlantic Fleets and bases where, at the height of the war, some 2,400 dental officers, 3,500 enlisted assistants, and 2,000 field or standard installations were engaged in providing dental treatment. Fleet or force dental officers were attached to the staff of the commanders of Seventh Fleet, the South Pacific Area, the Naval Forces Western Pacific, the Service Force, U. S. Atlantic Fleet, the Philippine Sea Frontier, the Fleet Marine Force Pacific Headquarters, the Service Force, the U. S. Pacific Fleet, the Marianas Area, the U. S. Atlantic Fleet, the U. S. Pacific Fleet, the Pacific Ocean Areas, and other organizations.

Until 28 June 1946, staff dental officers served under and rendered technical assistance to staff medical officers who were responsible for advising, recommending, or acting on dental matters handled by the commanders. After that date, staff dental officers were charged with that responsibility by law. This resulted in a logical change in organizational relationships and responsibilities, bringing the administration of dental matters in line with that of other technical services.

Since administration of an efficient technical service depends upon knowledge of the size and employment of the operating forces and the facilities supporting those forces, this change in responsibility required that staff dental officers be fully and broadly informed on plans, methods, procedures, and activities of the staff as a whole. This was accomplished by routing to the dental officer pertinent correspondence and dispatches, and by his attendance at staff conferences. Current command and organizational patterns and duties are described in the following parts of this article.

COMMAND RELATIONSHIPS.—A staff dental officer has no authority whatever independent of the commander to whose staff he is assigned. Primarily, he advises the commander on professional, technical, and administrative matters relating to dental service in the fleet, including matters having to do with support of that service in both the materiel and personnel sense. In addition to advisory functions, the staff dental officer may be authorized by the commander to act on dental matters within his cognizance. Ordinarily; that is restricted to day-to-day operations which do not involve a modification of existing policies.

ORGANIZATIONAL RELATIONSHIPS.—The organizational relationship of the dental officer and his office to the remainder of the staff and their offices may vary but, in general, it is one of two kinds depending upon the nature of the responsibilities of the commander.

The first kind is very much like the organizational relationship of the district dental officer on a district commandant's staff. The salient feature is that in the matter of *support* of dental service, the dental officer, like the medical officer, supply officer, ordnance officer, fleet maintenance officer and other staff officers (except the personnel officer) with logistic responsibilities, heads a section in the logistics division. In this position, he is responsible to the assistant chief of staff for logistics for advice and proper performance of duties relating to dental logistics, whether facilities, transportation, materiel, or personnel He is usually assigned a code number of two digits: the first (often 4) indicating logistics division, the second designating dental section. In addition to this relationship, the dental officer reports directly to the commander on strictly professional dental matters. For this, he is assigned a code number (76 is commonly used) outside those of any assistant chief of staff heading a division. This type organization is particularly adaptable to staffs of commanders in chief of fleets and areas, such as commander in chief, Pacific and U. S. Pacific Fleet (Cincpac/Cincpacflt).

The second type of organization is suitable for the staff of a type commander and especially that of a commander of a service force, which, being itself almost entirely logistic in function, may not have a logistic division. Here, the force dental officer or the fleet dental officer, if there is one, heads a division in the same sense as the fleet maintenance, medical, supply, and personnel officers and chaplain and is directly responsible to the commander for proper performance of duties related to professional, technical, and administrative measures of a dental nature.

DUTIES

GENERAL DUTIES.—Broadly speaking, the fleet and force dental officers are concerned with the following:

1. Supervise adherence to naval standards of professional service by subordinate divisions and units of the command.
2. Plan for establishment, expansion, maintenance, reduction, and disestablishment of dental facilities within the command.
3. Recommend (to the personnel officer on the staff) assignment and transfer of dental officers and dental technicians.
4. Coordinate dental activities within the command.
5. Inform subordinate units of the command of dental matters of interest or guidance value to them.
6. Inspect units of the command and report findings to the commander, forwarding to the Bureau of Medicine and Surgery recommendations, comments, and suggestions arising therefrom.
7. Promote professional interest and advancement in the interests of the Navy by arranging for meetings of dental personnel for discussion of professional, technical, or administrative subjects when circumstances are

favorable, and by disseminating timely information not otherwise obtainable.

8. Submit to the bureau at any time observations and recommendations not covered by other reports which relate to an increase in the value of the dental service or correction of deleterious situations.

SPECIFIC DUTIES.—Essentially, what follows under this heading are accounts of the duties of (1) the dental officer on the staff of the commander in chief of an area or fleet, (2) the dental officer on the staff of the commander of a service force, and (3) the dental officer of a type-command (other than service force). The duties of these dental officer billets vary in accordance with the nature of the duties and responsibilities of the respective commanders. It should be noted that the descriptions given below are intended to include possible wartime as well as peacetime measures.

1. *Fleet dental officer* (attached to staff of a commander in chief of an area or fleet) :—The functions of a dental officer so assigned are primarily administrative in character and essentially similar to those of other staff officers described above. In addition to these duties his activities involve evaluation and interpretation of current situations with the object of determining, acting, or advising on such policy decisions as:

a. The general ratio of dental officers, Medical Service Corps officers, warrant officers (dental clerks and chief dental clerks), and dental enlisted personnel [dental technicians (DT), dentalmen (DN), dental apprentices (DA), and dental recruits (DR), (peacetime rating structure) and dental technicians general, dental technicians prosthetic, and dental technicians repair (additional emergency ratings)] to over-all personnel to be maintained in various sectors of the theater or area or in subdivisions of the fleet.

b. The general type of equipment (field or standard) to be used in various locations.

c. Types and extent of treatment (general operative, or specialties as oral and dental surgery, periodontia, prosthodontia, etc.) to be made available in suitable localities.

d. General extent to which civilian populations of occupied areas should be given dental attention.

e. Supply levels to be maintained afloat and ashore routinely and in specific operations.

f. General supply responsibilities of agencies issuing dental materials.

g. General size and location of advanced base dental activities, such as fleet dental clinics and dental departments of other advanced base establishments.

h. Extension in amount and kind of professional service to the Army and Air Force and reciprocal receipt of same.

i. Criteria to be used in releasing dental supplies to other services.

j. General disposition, (by roll-up, surplus declaration, survey, and transfer) of dental material no longer needed in certain locations.

2. *Force dental officer* (attached to staff of a commander of a force) :—This title is used if this officer does not have additional duty as fleet dental officer; if he does, the latter term applies to both billets.

The duties of this officer are much more detailed than those described in par. 1 above, being mainly, but not entirely of the nature of implementation of policies and principles promulgated by higher authority. In that sense, they naturally conform to the responsibilities of the commander service force, who is the principal logistic agent of the commander in chief of the fleet, and type commander for construction battalions and naval auxiliaries, such as: cranes, docks, and dredges (AB, ABD, ABSD, AED, etc.), tenders (AD, AGP, ARST), repair ships (AR, ARH, ARC, ARD, ARG, ARB, etc.), salvage ships and tugs (ARS, ARSD, ATM, ATA, etc.), personnel carriers (APB, APL, APR), stores ships (bulk cargo—AE, AK, AKA) liquid cargo—AO, AOG, AW) (refrigerated cargo—AF, AKF) (miscellaneous cargo—AKN, AKS, AKV), and special types (hospital ships—AH, net laying ships—AN, miscellaneous auxiliaries—AG). In the former capacity, commander service force is charged with providing the whole fleet with services of all kinds required to carry out approved plans and policies except those performed for their specialties by commander air force and commanding general, fleet marine force. In the latter capacity, his responsibilities are entirely administrative and connected with maintenance of a state of readiness of the types mentioned.

These responsibilities are described in paragraph 3 below, which treats the functions of the type commander.

The functions of commander service force, therefore, fall into two classes:

a. Those pertaining to the *support* of all Navy facilities in the area under the military command of the commander in chief, and fleet units ashore or afloat in other areas. The last named provision is required because unified area command organizations outside the continental limits of the United States, as established on 1 January 1947, provide for no change in then existing intra-service logistics patterns and administrative cognizance as distinguished from military or operational command.

b. Those having to do with *administration* and *inspection* for performance and readiness of service type ships and units.

Support extends beyond the strictly operational or even the type organization of the service force to all fleet units afloat and ashore under the commander in chief's control. Support, in the sense used here, includes functions incident to supplying personnel and materiel in the amounts and at the times required for proper accomplishment of the mission of an activity in accordance with policy determination received from higher authority. Essentially, this involves the obtaining of new facilities from the continental United States and realining installations already established in the area. Support in the negative sense also includes roll-up which consists of the transferring of material from localities where need for it no longer exists to other places where new or additional facilities are required. In most instances, however, disposition of such material is effected by declaring all except controlled items to cognizant agencies (State or Interior Department) as surplus to the Navy. At various times, with the cooperation of other commands, inspections are made to explore ways that the service force might use, or recommend other commands to use, to increase both provision and reception of logistic support. These inspections are not to be confused with inspections whose purpose is to determine readiness and performance. They are restricted to own type ships as described below.

Administration is not ordinarily conducted in detail, but rather as carried out by naval district commands. That is, the service force command does not supervise the intimate details of work or administration of the several units or groups within its organization. Instead, it transacts necessary business with the commanding officers of those units with the aim of attaining maximum efficiency and coordination in the force as a whole. Besides the above means, this control is exercised by taking appropriate action based upon careful perusal and evaluation of information received in current correspondence forwarded to higher authority or on copies of forms sent to the commander service force for information.

Inspection to determine adequacy and quality of performance is also confined to activities within the service force type organization. Inspections of other activities are occasionally made.

Conforming in nature to the over-all *support*, and the *administration* and *inspection* functions of the commander service force, and in addition to the general duties described in the above paragraph, the duties of the force dental officer may comprise such activities as the following:

(1) Maintain records, files, and plans necessary to speedy accomplishment of dental logistic measures in the event of a sudden major change in the status of the fleet or shore bases.

(2) Maintain records and makes detailed recommendations (to the fleet personnel officer) regarding allowances of dental personnel enumerated in the above paragraph in service force activities and type and area.

(3) Analyze dental facilities' requirements in the area.

(4) Review requests for allotments, annual budgetary estimates, and the various reports required from dental departments in service force activities, and similar correspondence.

(5) Prepare correspondence regarding location, establishment, disestablishment, reduction, or expansion of dental facilities.

(6) Control stocks of dental supplies in accordance with policies received from higher authority. Screen requisitions, advises on excess and surplus items, pass on property sur-

vey reports, prepare correspondence on dental supply matters.

(7) Inspect service force activities regarding adequacy, maintenance, operation, and conformance to standards of treatment. This inspection may be conducted as a part of a general inspection or as a special dental inspection.

(8) Maintain liaison with the commander in chief (fleet dental officer) for the purpose of keeping informed on policy matters.

(9) Maintain liaison with the force dental surgeon, fleet Marine force, for handling matters of mutual interest.

(10) Correlate and summarize suggestions and recommendations concerning dental logistic matters received from ships and stations.

(11) Coordinate activities of afloat mobile dental units (such as dental personnel with portable equipment moving from ship to ship on temporary duty), when such are operated in the command.

(12) Consult with cognizant officers and make recommendations on maintenance and materiel policies.

(13) Pass on recommendations from ships and shore stations regarding requests for alterations of dental spaces.

(14) Confer on correspondence with area commanders with a view to coordinating dental facilities ashore available for ships' use.

(15) Designate locations and allowances of stocking points for dental materials.

(16) Recommend policies and plans for the supply of dental materials to the fleet, including shore activities.

(17) Plan and recommend automatic supply of dental material in amphibious operations.

(18) Recommend type and location of dental functional components (G13, G14, G15, G16, G27, G28, G29) in advanced base development plans.

(19) Implement general logistics plans, to the extent that dental logistics are involved, as promulgated by the commander in chief, by developing specific dental logistic plans and supply procedures as required.

(20) Supervise procurement, storage, and issue of dental materials and stores.

(21) Direct redistribution of stock as necessary in accordance with policy directives.

(22) Review and act on "in excess" requisitions.

(23) Cooperate in the implementation of general directives regarding declaration of surpluses and related activities, and advise on the redistribution of materials from places being abandoned, rolled-up, or reduced.

(24) Direct stock readiness, so far as dental materials are concerned, of service squadrons and mobile logistics groups, including variety and amounts of items carried for issue by barges (YFN) and stores issue ships (AKS).

(25) Keep the commander advised of dental personnel matters in the area and make recommendations to him regarding changes of policy, plans, and procedures necessitated by developing situations and requiring his approval.

(26) Plan for procurement and maintain trained personnel as required by approved operations and as directed by the commander in chief.

(27) Recommend the allocation by rate to type commanders of enlisted personnel allotted by BuPers for further assignment each month.

(28) Recommend measures for on-job training of dental personnel.

(29) Recommend distribution of all shore based dental officers in the area (not ordinarily done in peacetime).

(30) Make emergency assignments of dental officers afloat and ashore.

(31) Recommend specific distribution of dental enlisted personnel by name to ships assigned to the service force for administrative control.

3. *Force dental officer* (attached to the staff of a type commander)—Such a commander is concerned only with ships of a certain type allocated to him and only to the extent of, (1) controlling and supervising administrative measures designed to enable maximum performance of these vessels when assigned to task commanders for operational control, or (2) directing and arranging measures, such as overhaul and training, required to ensure complete readiness of ships not currently operating in a task force. Therefore, the duties of this force dental officer, in contradistinction to the two staff dental officers already described, are

relatively circumscribed and comparatively simple, being concerned mainly with carrying out directions, usually rather explicit, from higher authority or, in the case of logistics, from the service force, and with policy only to the extent of supervising compliance by units of the command and submitting recommendations applicable to the type controlled to the commander in chief of the fleet.

In addition to the general duties described, he may perform the following functions:

a. Insure material maintenance of dental spaces in ships in a suitable condition of readiness.

b. Keep the commander service force informed of service requirements.

c. Make recommendations to the commander, with a view to transmission to the commander in chief via the commander service force, (fleet maintenance officer), regarding alterations of dental spaces if these alterations involve any changes in military characteristics of the ships.

d. Recommend to the type commander alterations of dental spaces *not* involving military characteristics.

e. Insure compliance with the Bureau of Medicine and Surgery and fleet materiel maintenance directives.

f. Assist in the conduction of administrative, material, and damage control inspections, as required.

g. Insure compliance with Navy Department and fleet supply directives.

h. Make recommendations to the type commander, with a view to transmission to the commander in chief via the commander service force, regarding dental supply policies, procedures, and conditions of readiness as effecting ships of own type.

i. Recommend the redistribution of enlisted dental personnel within the type command.

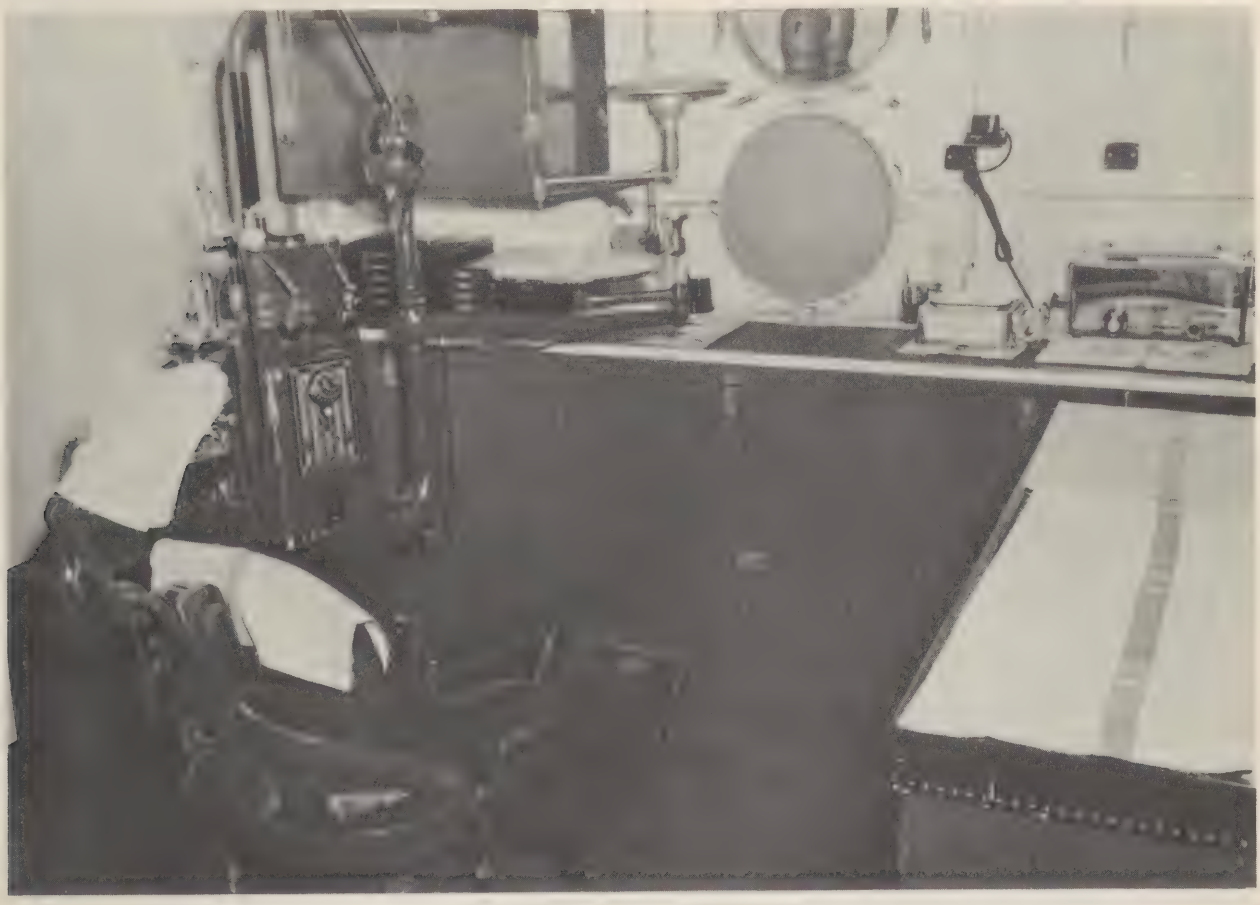


Figure 59.—Dental office aboard ship.

Maintain necessary records for this function.

j. Advise the type commander, with a view toward consolidation with other personnel requirements and transmission to the commander service force, of enlisted personnel requirements 3 months in advance.

k. Advise the type commander, with a view to consolidation and transmission to the commander service force, of the desired location of dental enlisted replacements 2 months in advance.

l. Recommend regarding on-job training programs for dental personnel.

m. Recommend to the type commander, with a view toward transmission to commander service force, the personnel requirements for special approved operations.

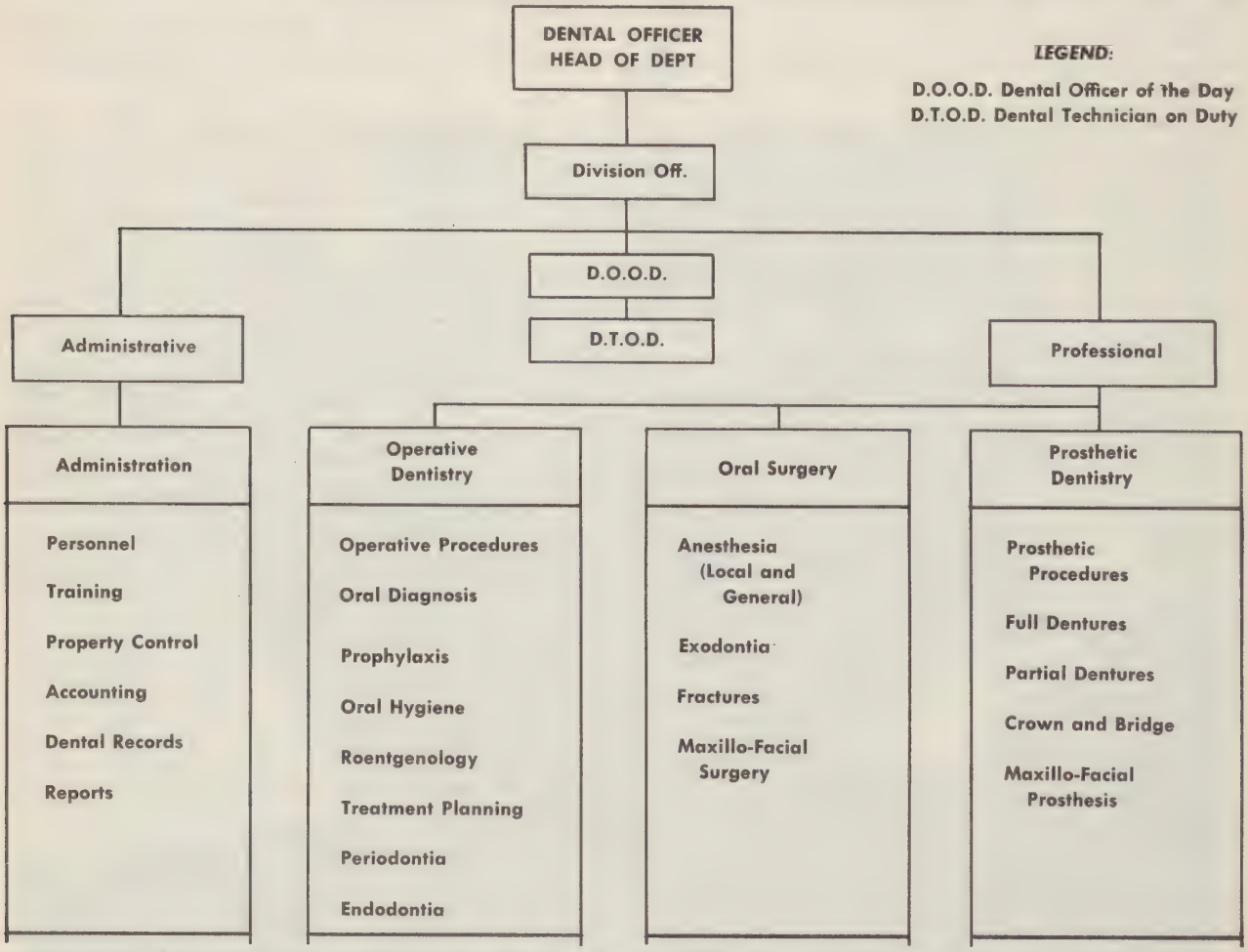
n. Recommend temporary assignments of officers within the type command to alleviate emergencies.

DENTAL OFFICER OF A SHIP (COMBAT AND AUXILIARY)

The senior officer of the Dental Corps attached to a ship (whether combat or auxiliary) is the head of the dental department.

As head of the department, it is his duty to assign the men and materiel allotted to the dental department so as to provide the maximum amount of dental care and to carry out directives issued by the Navy Department within the framework established by the ship's regulations.

THE DENTAL DEPARTMENT OF A SHIP.—The dental department in a vessel of the Navy is usually situated adjacent to the sick bay. The



Organization of Dental Department aboard ship with large dental staff The above subdivisions may be combined as necessary aboard ships which maintain smaller dental complements

Figure 60.—Organization chart. Typical dental department aboard ship with large dental staff.

type or class of ship will determine the size of its dental facility, ranging from a single allotted space or compartment equipped with one complete dental operating room component (dental chair, dental unit, dental instrument cabinet, sterilizer, sterilizer cabinet, linen cabinet, dental operating light, air compressor, dental X-ray) to several components with adjacent dark room equipped for developing and viewing X-rays and space within the room for storage of X-ray film; dental storeroom, administrative office, files for records, etc.

Some types of vessels, in addition to having one or more complete dental operating room components, also have a complete dental prosthetic laboratory component with an adjacent dental prosthetic operating room, to supply service to its crew and to the fleet units with which it operates.

ORGANIZATION CHART.—The most efficient system for determining the assignment of men and materiel is to prepare and use an organizational chart.

This chart should be revised from time to time as deficiencies present themselves or to account for changes in regulations or personnel allowances. It should also be carefully reviewed at regular intervals to determine whether all changes have been incorporated, all obsolete material removed, whether it is being observed by all. Steps should be taken to correct any deficiencies disclosed.

The accompanying organizational chart, together with an explanatory outline of the duties, functions, and responsibilities of dental personnel, may be incorporated into the ship's organization.

DEPARTMENT ORDERS.—Detailed standing orders to dental personnel are compiled in a booklet. These orders are prepared by the dental officer, approved by the commanding officer, numbered serially, and promulgated to all dental personnel as an instrument of departmental policy. These orders must be reviewed periodically to establish that they agree with existing Navy Department directives, ship's regulations, and the departmental organization chart. Care should also be taken to remove all obsolete or duplicating directives.

DEPARTMENT MEMORANDA.—Directives of a minor or temporary nature are usually issued as memoranda. Each memorandum is numbered serially and is promulgated in the same manner as a department order. Memorandums should be reviewed frequently and outdated material removed.

WATCH, QUARTER AND STATION BILL.—A watch, quarter and station bill should be prepared by the dental officer and posted in a prominent position in the dental department. This bill should be prepared in accordance with instructions contained in ship's regulations and must agree with the departmental organization chart, orders, and memorandums.

The watch, quarter and station bill contains a list of dental personnel by name and indicates their regular duty assignments, cleaning detail, berthing assignment, and duties during drills. As a rule, entries on this bill are made in pencil so that changes can readily be made.

PROFESSIONAL DUTIES

APPOINTMENTS AND DENTAL SICK CALL.—The establishment of an appointment system is the first requirement. Whatever the method decided upon it should correspond to the established working hours.

Sick call is normally held at 0800 and 1300, at which time post-operative patients, emergency patients, and patient seeking routine examinations are seen. The remainder of the day should be devoted to previously scheduled patients. Appointments should not be made too far in advance, nor made at a time which would conflict with the patient's assigned watches.

Some ships give the patient a dental appointment chit as a reminder of the day and time of the appointment, others publish the appointments in the ship's plan of the day. Both methods are effective in reducing the number of broken appointments.

Hospital ships, tenders, and repair ships often find it difficult to maintain an elaborate appointment system because of the movements and limited availability of ships dependent upon them for dental treatment. Dental officers aboard these ships must devise a system to meet local situations.

CARE OF PATIENTS.—The primary task of a dental officer on board ship is to maintain the

dental health of the crew and to hold to a minimum the number of man days lost because of dental defects. To accomplish this, he must give priority to cases requiring immediate treatment or those which would soon become emergency in nature. In giving treatment, the dental officer must endeavor to correct all dental defects in each patient. However, this rule may have to be modified when the demands on his time become excessive.

PROSTHETIC DENTAL TREATMENT.—Many of the larger auxiliary ship maintain facilities to provide prosthesis for their crews and for the crews of other ships in the fleet. The Fleet Dental Officer can provide a list of ships in the immediate vicinity which provide prosthetic service and the location of nearby shore-based prosthetic facilities. Ship dental officers usually deal directly with the prosthetic facility in arranging appointments for their patients, though some activities may make appointments through the fleet dental officer.

Patients who are to be referred to another activity for prosthetic treatment should first be treated for all dental defects—i.e., all necessary restorations must be inserted, extractions performed, and the remaining teeth scaled and polished. In some cases it may be wise to refer the patient to the prosthetic facility for advice and consultation prior to undertaking any treatment. The prosthetic dental officer is then in a position to offer advice on operative and surgical treatment needed to prepare the mouth for the appliance he intends to design. This will eliminate possible differences of professional opinion at a later stage, and minimize delay in treatment.

For minor repairs of acrylic dentures, crowns and facings, an emergency denture repair kit is available for all ships, and may be requisitioned through proper channels.

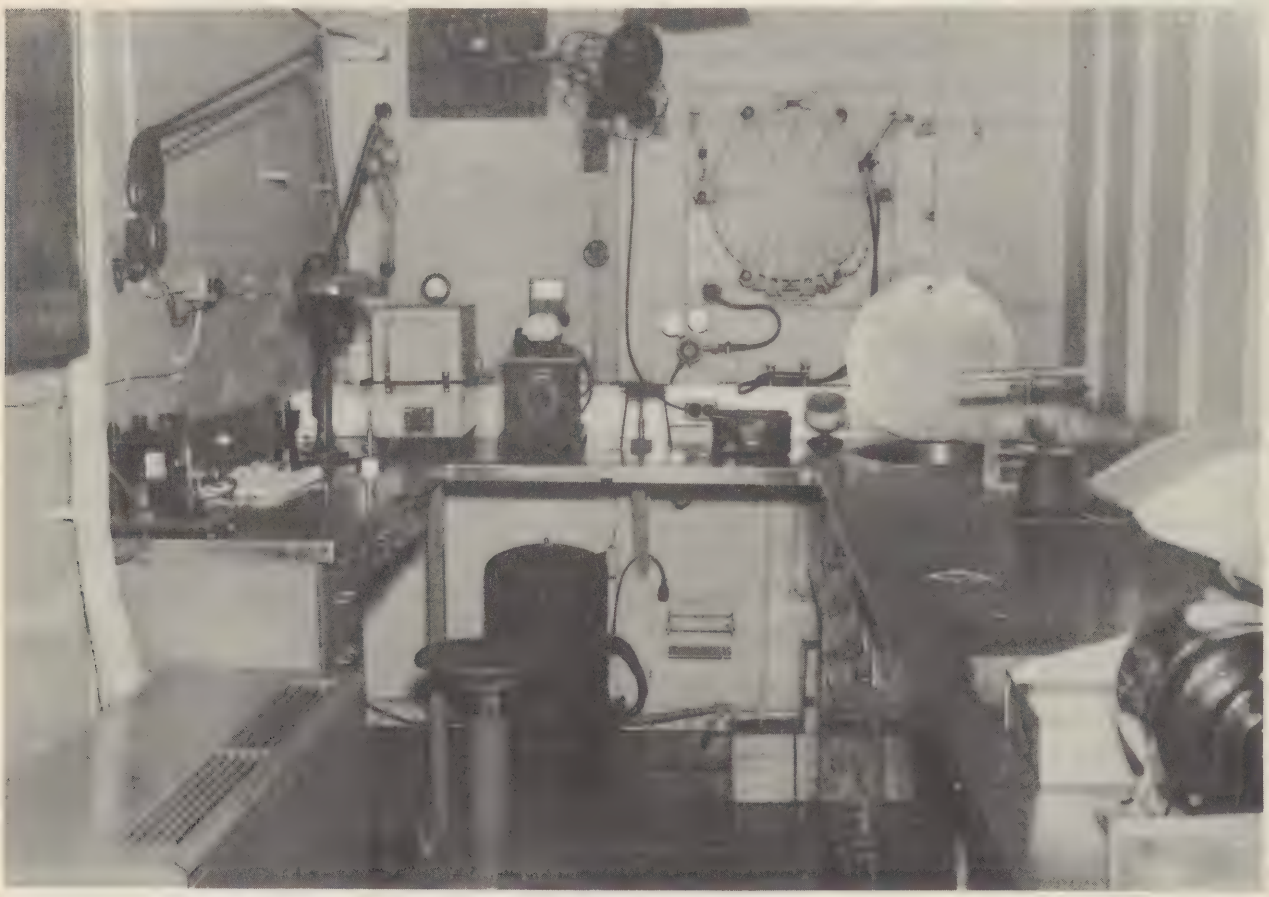


Figure 61.—Prosthetic dental laboratory aboard ship.

MAXILLO-FACIAL PROSTHESIS.—Very little maxillo-facial prosthesis is provided on board ship because of the length of time required for proper treatment. As a general rule, patients requiring treatment which will cause them to be absent from their regular duties for any great length of time will be transferred to the nearest naval hospital.

RECORDS AND ACCOUNTS.—Detailed instructions regarding the preparation of records and accounts are contained in other sections of this course, in the *Manual* of the Medical Department, and in directives issued by the Navy Department. The point to be stressed here is the prompt recording of dental treatment as it is rendered. By immediately entering all treatment in the dental appointment book and on the dental record of the patient's health record immediately, the dental officer can be certain that the source of the statistics to be entered in his regular reports is complete and that the dental records of his patients are in good order.

DENTAL HEALTH SURVEYS.—The procedures to be followed in conducting a dental health survey will vary from one ship to another, depending upon the size of the crew, the number of ships serviced, ships' movements, and a host of other factors. Some systematic procedure, however, should be established to assure the dental officer that he examines the mouth and the dental record of each man under his jurisdiction at regular intervals.

Some dental officers examine the crew alphabetically, publishing the names or alphabetical groups to be examined each day in the ship's plan of the day. Other dental officers prefer examining the crew by division, calling one or more divisions in for examination each day until the entire crew has been examined and each man's mouth compared with his dental record.

Several other systems are in effect also, each designed to meet local problems, but one feature is present in virtually all successful systems. That is, each person reporting on board or being detached from the ship is examined by the dental officer. This last procedure enables the dental officer to detect disabilities on incoming personnel and errors in dental records. It also gives him an opportunity to assure himself that every dental abstract leaving his office presents a true picture of the man's dental condition.

BINNACLE LIST (NAVMED FORM-S).—Patients with dental conditions that render them unfit for duty may be placed on the binnacle list by the dental officer via the medical officer. This list is prepared after morning sick call and is submitted to the commanding officer within the time limit contained in ship's regulations. It is then approved by the commanding officer. It informs the commanding officer, the executive officer, the officer of the deck, and the division officers of those men excused from duty for that day.

SICK LIST (NAVMED FORM T).—If the patient remains unfit for duty at sick call the following morning he is then placed on the sick list. If the patient originally had a condition that, from all appearances, required more than 24 hours to recuperate, he should have then been placed on the sick list rather than the binnacle list. The sick list must be submitted within the time limits established by the commanding officer in ship's regulations.

At the time of admission to the sick list a NavMed form F must be prepared with the diagnostic number and diagnostic title of the condition for which the patient is admitted. Only Navy diagnostic numbers and titles as listed in the standard nomenclature may be used. This form will be prepared by the medical department on most ships, using the diagnosis supplied by the dental officer. The dental officer will always notify the medical officer when he places a patient on the sick list for a dental condition and, during the course of treatment, the dental officer must consult and collaborate with the medical officer. Unless the patient is treated jointly by the medical and dental officers, the dental officer will sign the "doctor's order book" for all treatment and medication. The clinical notes shall also be maintained by the dental officer. When the patient has been discharged or transferred by the medical officer, upon recommendation of the dental officer, a brief history of the case and its course will be entered on the patient's medical history sheet (NavMed form H8). This entry will be signed by the dental officer and approved by the medical officer.

ADMINISTRATIVE PROCEDURES ABOARD SHIP.—The dental officer on board a naval vessel is required to carry out the same basic administrative procedures as does his counterpart at a shore based naval station, except that his accounting procedures are often simplified.

In time of war, and other emergency, dental activities afloat are often excused from the task of preparing detailed financial reports. Instead, the Bureau usually outlines a simple letter-type report for medical and dental units afloat. Though detailed reports may be eliminated, the dental officer will still be required to maintain his files in proper order so that the Navy Department can obtain any needed information in the future. All correspondence must be filed in accordance with the *Navy Filing Manual* and supplies and equipment ledgers must be kept up to date, subject to audit by the fleet dental officer or by a representative of the Bureau of Medicine and Surgery.

More detailed instructions regarding administrative procedures may be found in the chapter dealing with administration, forms, and procedures. The fleet dental officer can provide information regarding the exact procedures to be followed by any specific fleet unit under his jurisdiction.

MILITARY DUTIES

BATTLE AND EMERGENCY STATIONS.—The dental officer performs such duties in battle or in emergencies in connection with the care of the sick and wounded as the commanding officer may direct.

The locations of first aid stations vary in the several types of vessels. However, the dental officer may be ordered to any part of the ship to treat a casualty, and for that reason should familiarize himself with all parts of the ship. He should pay particular attention to routes, hatches, exits, etc. that are available when watertight conditions are set. The location of quick action watertight doors should also be noted. A blueprint of the ship obtained from the first lieutenant is very helpful for this purpose. While manning battle or emergency stations for drills an excellent opportunity presents itself for first aid instruction to the dental personnel.

MILITARY DUTIES AS A DEPARTMENT HEAD OR DIVISION OFFICER.—The dental officer aboard ship is a link in the chain of command. He must, therefore, be prepared to assume the military responsibilities that this position entails.

In order to carry out his responsibilities, the dental officer must:

1. Learn the rules of conduct for an officer.
2. Learn the fundamentals of leadership.
3. Learn military procedures:

a. For giving, receiving, and carrying out orders.

b. For parade, formation, and close order marching.

c. For mustering division at quarters.

d. For making:

(1) Muster reports.

(2) Inspection reports.

(3) Manning and securing from drills reports.

(4) Eight o'clock (evening) report.

4. Know rules and regulations governing saluting and military courtesy.
5. Learn and observe the customs and traditions of the Navy.
6. Learn more about the Navy than just the field of dentistry. Know your ship, its workings and its parts. Learn to speak the language of the Navy.

LIMITATION ON ASSIGNMENT OF MILITARY DUTIES TO DENTAL OFFICERS.—No member of the Dental Corps shall be detailed to perform duties contravening the provisions of the international agreements which pertain to the noncombatant status of such persons. (*U. S. Navy Regulations,* 1948).

DENTAL GUARD.—When two or more ships are in proximity to each other while liberty is being granted, the senior officer present afloat designates the daily order in which each ship having a dental officer takes the dental guard, unless other adequate provisions are made.

COLLATERAL DUTIES

POLICY OF ASSIGNING COLLATERAL DUTIES.—Dental officers afloat may be assigned nonprofessional collateral duties. Such duties should be accepted cheerfully and a serious effort made to perform them to the best of the officer's ability. Most collateral duties offer a new and novel experience and are not so time consuming as to interfere with the practice of dentistry.

Some of the more commonly assigned collateral duties are:

1. Wardroom mess officer or caterer.
2. Member of summary or general courts martial.
3. Athletic officer.
4. Welfare and recreation committee.
5. Auditing boards.
6. Swimming instructor.
7. Inventory and survey boards.
8. Cash verification boards.
9. Photographic officer.
10. Bond and education officer.
11. Wardroom calling committee.

TRAINING OF DENTAL PERSONNEL.—The training of enlisted dental personnel for advancement in rating, and their training for duties in battle or emergencies, is the responsibility of the dental officer. Regularly scheduled classes, reading assignments, demonstration, and day by day instructions and supervision will help enlisted personnel fulfill requirements for advancement in rating.

During battle or emergency drills dental personnel usually man first aid dressing stations. The dental officer prepares himself to take advantage of the opportunities afforded by these drills to train his subordinate in first aid treatments for the following:

1. Burns.
2. Shock.
3. Hemorrhage.
4. Fractures
5. Traumatic soft tissue wounds.
6. Gas and chemical casualties.
7. Instructions for the parenteral administration of plasma, drugs and fluids.

DENTAL OFFICER ABOARD A HOSPITAL SHIP.—The duties of a dental officer on board a hospital ship are almost identical to those of a dental officer in a shore based hospital as described in chapter 4, "Medical Department Orientation."

The senior dental officer on board a hospital ship is the chief of the dental service, rather than head of the dental department as is the case on board other types of naval vessels.

The dental officer's collateral duties on a hospital ship may differ from those at a shore based hospital. Such collateral duties to meet probems resulting from fleet operations, will be described in detail in the ship's organization, and specific instructions will be found in ship's regulations, orders and memorandums.

DENTAL OFFICERS WITH BASE, EVACUATION AND MOBILE HOSPITALS.—Administratively, the functions of a dental officer serving with a base, evacuation, or mobile hospital will be much the same as those of a dental officer serving with a naval hospital in the United States. Dentistry, in each case, is considered a regular service of the hospital in the same manner as the surgical service, E.E.N.T., etc. The real difference between these types of hospitals lies in the facilities available for the performance of dentistry.

Naval hospitals in the United States, as a rule, enjoy the advantages of permanent buildings, satisfactory utilities, ready accessibility to other naval activities, and a relatively reliable source of supplies. The facilities at evacuation, mobile and base hospitals, however, are usually limited in one or more of these respects.

Evacuation hospitals are often set up in tents and the area, equipment, and facilities allotted to the dental department are sometimes determined by the over-all logistic needs of the entire unit, rather than the desires of dental personnel.

Mobile and base hospitals usually enjoy slightly better conditions since they can be set up for longer periods than evacuation hospitals would normally be expected to operate. These, too, however, are usually first set up in tents.

Officers of the Dental Corps assigned to evacuation, mobile, and base hospitals must train themselves to work with a minimum of equipment and under the most adverse conditions.

These hospitals are sometimes forced to operate where water, electricity, sewage, and transportation are very limited. For this reason, dental officers must learn to operate with field dental units which rely upon local generators or foot pedals for power.

The shipping space allotted to one of these hospitals while in transit to an assigned destination is often curtailed, and the portion of the space which may be utilized by the dental service is also limited. Because of this, officers of the Dental Corps assigned to these hospitals must decide which items of dental supplies and

equipment are essential to their needs and to eliminate all unnecessary items from their requisitions. This, in itself, is not enough, however, since an activity in transit can not rely on a reliable source of supply to replenish stock. For this reason, officers of the Dental Corps must learn to exercise the greatest economy in the use of dental supplies.

The mere fact that a requisition has been submitted to a supply depot in the United States gives no assurance that new stocks will be forthcoming since these depots may have difficulty in procuring certain items and delays often result from shipping difficulties, especially in time of war or national emergency.

As mobile and base hospitals become established, conditions will gradually become better. More permanent buildings are erected, power and utility services are made available, transportation facilities improve, supply schedules become more regular, and heavier items of equipment are installed.

In time of war or national emergency, many items of dental equipment become very scarce and thus are not immediately available to new activities. For this reason, many dental officers attached to forward hospitals have found it advisable to improvise or construct satisfactory substitutes. Assistance in this matter can usually be obtained from local maintenance or construction battalions.

It is not possible to describe here every problem which will present itself at an evacuation, mobile, or base hospital as the problems of any one activity will differ from those of other activities. It is only to point out the fact that facilities made available to dental officers serving with advance hospitals may be limited by the logistic problems of all the activities present. Each dental officer will therefore be called upon to use his own ingenuity and imagination in order to devise the means by which he will be able to render the best possible dental service with the facilities at his disposal.

The physical accommodations, organizational and professional functions of base, evacuation, and mobile hospitals are fully described in chapter 4, "Medical Department Orientation."

DENTAL OFFICERS IN AMPHIBIOUS OPERATIONS

TASKS AND RESPONSIBILITIES.—The dental officer in amphibious operations must not only be professionally competent in his field, but also be prepared to undertake other measures for the care of the sick and wounded. Experience has taught us that combat training is necessary and desirable for the proper care of those dependent upon us as well as to ourselves. There have been numerous situations, which called for alert thinking, knowledge of the mission at hand, and versatile ability among dental corps personnel. An attempt will be made to present the over-all picture so that an individual may visualize his task.

Let us consider the term "amphibious operation." What does it mean? When used in military parlance it may mean anything from a handful of men in a rubber boat to a full-scale operation comprising units of Army, Navy, Marines and Coast Guard in a land, sea, and air assault. Therefore, to understand the term, we must know about the specific composition of the force, its organization, and its mission. We must know each unit and its individual working methods. We must also know what weapons are to be used and what transportation is available.

The most desirable plans of mobilization call for a period during which personnel may be assembled into units, and trained and equipped for specific functions. Circumstances may not always allow sufficient time for this period and we may be forced into conflict relying upon our own resourcefulness and past experience for the task assigned us.

The simplest unit for an amphibious operation, so far as the dental officer is concerned would be a "combat team." This would mean a complete fighting unit, self supporting, and self sustaining. Its size would be determined by the mission at hand and the personnel and equipment available.

The force as a whole may include units of infantry, artillery, special weapons, air cover, sea power for the softening-up process and for subsequent protection, and a medical detachment organized for the specific job.

The medical detachment may be composed of a few corpsmen and an officer of the Medical Corps, or one of more complete medical companies. If the combat force is composed of one Marine regiment reinforced (augmented by

necessary special weapons and artillery), one complete medical company in addition to its regimental and battalion medical sections would accompany it. In World War II one dental officer was provided to each medical company and one in each regimental headquarters. No dental personnel are actually allowed for medical companies at the present time, but one or more dental officers may be assigned to a medical company by the division dental officer, if required.

Essential dental treatment should be completed in staging areas and in training centers, while actual dental operations in combat areas are of a necessity kept at a minimum. This does not, however, mean that the combat dental officer has less work to do.

If assigned to duty with an organization other than the division dental section, the dental officer should first, if possible, make sure that all personnel are dentally fit, for the sojourn in the staging area is apt to be cut short by combat training and maneuvers. The individual dental officers have all been through preliminary training and indictrination, but now this individual preparedness must be synchronized into the more complex functions of the whole unit.

FIELD EQUIPMENT.—It is of great importance to check the dental equipment, to make sure there is enough and yet not too much. Each dental officer will require an emergency field and dental kit and a portable field dental unit number 35 or chest number 60. He will require the assistance of one dental technician who will carry two field medical kits. The dental officer's and the dental technician's field kits combined form an adequate armamentarium for emergency operations in the combat area and should be reserved for that purpose. The supplies and instruments in all kits should be checked and kept in a constant state of readiness. The dental assistant's kits must be inspected periodically to insure their availability for immediate use.

In addition to the usual supplies and equipment in the field kits, empty metal containers, and cloth or canvas rolls and cases should be provided in which the dental officer may include such nonlisted items as he sees fit. Many times the mission of the combat team will determine the selection of these additional items. If the operation appears to be one extending over a long period of time in tropical country, one may well include medication for the treatment and prophylaxis of Vincent's disease, gingivitis, fungus infections, etc. There always should be an abundant supply of battle dressings, morphine, and other first aid items for use in combat areas. With the battle pack, or the more usual transport pack, in addition to the field medical kit and a few personal items hanging from the neck or waist of the individual, the problem of going over the side, down a cargo net, and a subsequent forced march through a jungle becomes increasingly difficult.

The field dental operative unit (unit number 35) is a compact, well planned and well equipped dental "office." It is a portable and not a mobile unit. This must be taken into account by the cargo officer in loading a ship for cambat. It will be one of the first pieces of freight to be loaded and the last to be unloaded.

A newly designed unit known as dental operative set, field No. 60, a compact, well planned, and well equipped dental "office" packed in one chest is to replace unit No. 35 as soon as available. A division or brigade dental section will also be allowed the dental prosthetic set, field No. 61, and the dental prosthetic set, field No. 62.

The field unit No. 35 contains six chests compactly arranged in one large case. Chest No. 1 contains a dental operating, folding chair. Chest No. 2 carries a dental foot engine with an all cord arm. Chest No. 3 is a field desk packed with office and dental supplies and equipment. Chest No. 4 contains linen, trays, bucket, wash basin, etc. Chest No. 5 has supplies and equipment. Chest No. 6 is a portable field operating lamp convertable to almost any type electricity (110-240 volts, a.c.—d.c. or battery). The large outside case is designed to be used as a table when the chests are removed. Chests Nos. 4 and 5 can be placed on end and used as operating cabinets, having adjustable shelves for instruments and linen. Assembled in a regulation hospital tent or in a pyramidal squad tent, a very adequate office is provided and with a little ingenuity, a most practicable one.



Figure 62.—Naval dental service in the field—World War II—Field Unit No. 35 in operation.

COMBAT TEAM.—The combat team is given intensive combat training and maneuvers in a suitable area. Here the personnel learn to live and to work in the field as a fighting unit as well as individuals. Instruction is given in the care and treatment of casualties from the time they are picked up on the front line, shuttled back through the collecting station to the evacuation hospital, and evacuated either by ship or by plane. The dental officer discovers that he has many duties other than dentistry. He may find himself in charge of a collecting station, a squad of litter bearers, or the shuttle chain of evacuation. On the other hand he may be detailed to the dressing tent, surgery, one of the wards in an evacuation hospital, or even to the burial service where positive identification is of the utmost importance.

In addition to these things, the organization, tactics, and science of amphibious warfare is studied. A sound understanding of the over-all picture is essential to the successful performance of one's duties in combat.

LANDINGS.—Following the activation and intensive field training of the unit, advanced maneuvers and ship to shore drills are undertaken with the naval forces, thus giving familiarity with all types of transport ships and landing craft. Each presents its own particular problems; all should be understood.

The attack transport ship to shore run envolves one of the oldest methods known to Marines, that of going over the side, down cargo nets, into small boats, and landing on the beach. A lot of planning is necessary to execute this maneuver smoothly, and the shortest time possible. Those men who will be landed first on the beach (the shock troops) go over the side into the small boats. When these small boats are loaded they move away from the ship and form a circle at a designated spot known as the rendezvous area, thus making way for empty boats to move alongside and become loaded in turn. The rendezvous circle must be completely formed at a given time in order to join with boats from other ships. It constitutes a prearranged wave whose departure from the various rendezvous areas and arrival at the beachhead has all been calculated and timed to fit into the schedule of the whole operation. This point cannot be overstressed for the barrage from sea and air is lifted as the first wave hits the beach and any deviation from "H" hour may be disastrous.

One might very well ask, "Of what importance is this to a dental officer?" Anyone in an official position or capacity must be as completely informed as possible with regard to all details of the operation whether it is his responsibility or not. A good example of this can be found in the story of the first wave in the first landing by the Marines in World War II. A dental officer found at the last moment that he was the only officer present in a boat full of men scheduled to land on the beach at "H" hour plus five minutes. The full implication of the responsibility became apparent upon the discovery that somehow the small boats had been switched in loading and the regularly assigned coxswain was nowhere in sight. At the signal for departure the new coxswain asked the dental officer for the position of the boat in the wave and what course to set for the beach. Whereupon the dental officer blurted something to the effect, "Good Lord, man, don't you know?" and after some discussion vaguely recalled having heard the troop commander stress this point at one of his conferences with the company commanders. He wished now that he had made a note of the course and exact time of departure from the rendezvous area, but he had left it to the coxswain. However, there they were, ten miles from the beach, tossing on a dark and stormy sea, and the coxswain hadn't gotten the word!

"We're to hit Red Beach at "H" plus five and I think the course is forty-three degrees," said the dental officer. Fortunately he was close enough to get off with the correct wave and in the right direction. Once the wave formed it was just a matter of following the other boats in to the beach. Since there were two separate landings being executed simultaneously, it was important that he at least keep with his own unit, else he might hit Tulagi instead of Guadalcanal and become permanently detached from his team, for there could be no turning back once the wave formed and headed shoreward. Thus it becomes apparent that the dental officer should be more than just familiar with the plans and the methods of amphibious operations.

BEACH-HEAD.—When the beach-head is established and the troops move inland the regimental dental officer with the regimental headquarters medical section may be required to establish and operate a collecting station where casualties may be gathered, treated, and prepared for removal to the evacuation hospital. During the heat and excitement of combat and the fluid position of the regiment this is not a simple matter. The collecting station must maintain at all costs a close contact with both the battalion aid stations and the shuttle chain to the evacuation hospital. Casualties will be brought into the collecting station on foot, by litter, or by field ambulance where practicable, and may either be held, returned to the front, or taken to the evacuation hospital. The collecting station not only plays the role of a first aid station, but also sorts out the cases and passes judgment on the extent of injury; a job upon which disposition depends. The dental officer is often the traffic director for the station. When casualties are heavy he need not worry about what to do with his spare time.

The dental officer, in preparing for combat, must be well indoctrinated in first aid and other problems of a more specific medical nature. He should have a sound knowledge of the early treatment of shock, fractures, gun-shot wounds, and the control of hemorrhages by proper use of the tourniquet and the application of simple pressure bandages. He should be familiar with operating room techniques and be prepared to adapt them to the field when called upon to assist in general surgery, or to conduct cases in his own field.

EVACUATION HOSPITAL.—These additional or extracurricular activities are emergency or battle duties. During quiet periods there will be plenty of dentistry in the portable office as well as those duties not of an emergency or battle nature which befall the lot of the dental officer in the evacuation hospital. These duties point up the versatility expected of a dental officer and suggest the personal responsibility involved in meeting such a challenge.

LOGISTICS.—Recognition by the Bureau of Medicine and Surgery of the value and necessity of dental personnel with combat units was apparent early in World War II. New tables of organization allowed for an increase of two hundred and fifty-five percent in the authorized complement of dental personnel attached to Marine divisions. The original table called for one dental officer with each regiment, one in each medical company, a senior dental officer in the headquarters and service company, and one to a division. When the medical battalion was increased from four to five companies another dental officer was added, bringing the total to ten. A short time later a revision of organization tables authorized a dental section in the headquarters and service company, thus increasing the total number of dental officers in a division to 32. Present tables call for 13 dental officers and 24 dental technicians in a peacetime division, and 26 dental officers and 46 dental technicians in a war strength division.

The war strength tables of organization for a Marine division allow 20 dental officers for the division dental section, which is part of the medical battalion. The division dental section is placed under the medical battalion for berthing, messing, transportation, etc. However, for all professional purposes it is under the direct supervision of the division dental officer. The division dental officer, through the commanding officer of the division, may detach certain officers from the division dental section and assign them to other units in the division when required.

The division dental section functions as a moble dental clinic. It is allowed personnel and equipment in order to perform all types of dental treatment, including prosthetic.

Logistics in World War II included for the first time prosthetic supplies and equipment in field units, and thus made for a more fully equipped staff.

Much study and research was given to dentistry in the field during World War II and many advancements and improvements were made. Mobile units, fleet dental clinics, and dental clinic ships were designated to improve the service and to make it more available to the fighting man at the front. The fleet dental clinics could be erected and staffed shortly after an island was secured; however, as the fighting moved on the clinic was left behind and it became obvious that to serve the men at the front something more mobile must be used.



Figure 63.—Marine division dental clinic in the field.

The large semi-trailer truck clinic was an answer, but the number of these necessary to supply adequate service was prohibitive in most cases, while the transporting, loading and unloading of them from ships where docking facilities were meager or lacking was another disadvantage.

The answer seemed to be the floating clinic, but the end of the war prevented experimentation along these lines. An LST could easily have been converted into a dental clinic ship which could be moved up with the troops from island to island and/or utilized in other areas where such facilities could be used to the best advantage.

BEACH PARTY.—Most of the discussion here has been with the dental officer attached to the Marine Corps, but there is another important phase to the role of the dental officer in amphibious operations; namely that in connection with the sea-going forces or naval personnel in amphibious units. On any landing operation there is a detail called "the beach party," assigned by the naval forces, and composed of personnel attached to the ships. The beach party includes such men as the boat captain who supervises the operation of landing craft, the beach officer who runs the operation on the beach as far as naval personnel are concerned, the medical section whose primary function is the receiving of casualties from the landing force and their evacuation out to the ships, and such other personnel as may be called for by the operation. A dental officer is usually included for such duty as may be assigned by the division dental officer. The evacuation of the casualties from the evacuation hospital or the battalion aid stations is through the medical section of the beach party for removal to the ships. The beach party of course assumes responsibility at the beach and once the evacuees are delivered there the medical personnel from the landing force are free to return to their respective commands.

AIR EVACUATION.—A more recently developed but far more satisfactory method of evacuating casualties is by air transport. Introduced at Guadalcanal, this method proved to be so desirable that separate commands were later set up to insure its operation. It was possible to have a patient in a continental hospital four days after he was wounded, but what

seemed more important to the men was their removal from the dangerous and unpleasant surroundings of the combat area almost immediately. Realization of the quiet solitude of a peaceful environment was a tremendous boost to the morale of the patient and indirectly to the fighting man at the front. This method of evacuation was also a boon to the officer in charge of evacuation, for it enabled a faster removal of casualties. When only one or two ships a week were available patients had to be hospitalized before removal, but by this method they could be given first aid and taken to the air field for immediate removal by plane.

Evacuation in most operations is by land, sea, or air and the officer in charge of this detail will almost always have one or more methods available for use. He should, therefore, keep a constant watch on schedules of all methods and means in order to utilize their services to the best advantage. Air evacuation is usually reserved for priority cases. For some it is contra indicated. The latter are evacuated by ship. Another war undoubtedly will present entirely different requirements and conditions but for the present we must be prepared to use the means now available. Dental officers may expect to be delegated some of this responsibility.

The role of the dental officer in amphibious operations is, therefore, complex and varied. He may be called upon to render a simple health service or a major operation. His treatment may be preventive or restorative for anything from battle fatigue to destruction by shell fragment.

DIVISION OR BRIGADE

DENTAL SERVICE, STANDARD OPERATING PROCEDURE.—Fleet Marine Force organizations, as a rule, are highly mobile, so most dental service must be rendered in temporary installations in the field, frequently under tentage.

The current Marine Corps tables of organization provide a dental section, within division headquarters, as part of the Division Special Staff, consisting of the senior dental officer, a medical service corps officer, or a dental clerk (warrant officer, Hospital Corps), to serve as administrative assistant to the division dental officer, and a chief dental technician.

The division dental officer is a member of the special staff of the commanding general. He is directly responsible to the commanding general for all professional, technical, and administrative matters in connection with the dental services of the Division. He recommends such transfers and employment of dental personnel and equipment as may be necessary for maximum utilization of the division dental facilities. The term "dental personnel" as used herein includes all officers of the Dental Corps and such other officers and enlisted personnel as may be assigned to dental activities.

In the absence of the division dental officer, the officer of the Dental Corps next in rank attached to the Division acts as the division dental officer.

As a rule, officers of the Dental Corps ordered to a Marine Division report to the commanding general, who in turn assigns them to duty within the division as recommended by the Division dental officer. Most of the dental officers reporting to the commanding general are assigned to duty in the Division Dental Section, which is part of the Medical Battalion. The Division Dental Section is organized so as to provide both general and prosthetic dental treatment for all personnel attached to the division.

As prescribed in *Navy Regulations*, "The Dental Officer" performs such duties in battle or in emergencies in connection with the care of the sick and injured as the commanding officer may direct. In addition to furnishing dental treatment as required, dental personnel may be assigned during actual battle operations to duties involving the care, treatment, and evacuation of casualties.

During the initial phase of battle operations it may be possible to utilize field kits for the rendering of emergency dental treatment. As soon as practicable, Dental Field Operating Unit No. 35 or Dental Field Chest No. 60, are set up and routine dental service instituted.

ORGANIZATION.

Division in bivouac or garrison.

1. The general duties of the division dental officer are as outlined in *Navy Regulations* and the *Manual of the Medical Department* for the dental officer of a shore station. The duties

of a staff dental officer are also included insofar as they are applicable to the division.

2. The care and treatment of all dental conditions are under the control of the division dental officer, who is responsible directly to the commanding general.

3. The division dental officer originates and issues, through the commanding general, regulations and orders governing the internal organization and functions of dental activities of the division. These are of sufficient scope and detail to provide:

a. An orderly routine, satisfactory maintenance, and efficient utilization of dental facilities and employment of personnel to provide an adequate dental service for the division.

b. Adequate supervision and precautions for protection of patients, and close collaboration with medical officers for the best interest of the patients.

c. Appropriate collaboration with the division medical officer and organization commanders on matters of mutual cognizance and interest.

4. A systematic examination of all personnel is conducted and such actual and prophylactic treatment as is indicated to prepare personnel for combat operations is carried out.

DIVISION IN TRAINING FOR COMBAT OPERATIONS.

Only such dental personnel accompanies the forward echelon of the division as are needed to give emergency care, assist in evacuation, and aid in the care of casualties. Normally these are limited to the division dental officer and the dental officers assigned by the commanding general as recommended by the division dental officer to cope with the situation at hand.

EQUIPMENT AND SUPPLIES.

Bivouac or garrison.

1. The division dental officer complies with *Navy Regulations, Manual of the Medical Department,* and current directives in the procurement, inspection, storage, issue, transfer and accountability of dental property.

2. Current operating supplies are issued to each unit as required from the division dental supply storeroom.

Operations.

1. All equipment and supplies are in a state of readiness before embarkation.

2. Dental field units and initial supplies for 30 days, with 30-day replenishments, are set up in constant readiness and stored in the dental supply storeroom for each organization having a dental activity.

EMPLOYMENT OF DENTAL PERSONNEL IN COMBAT OPERATIONS.

Training.

1. Dental personnel must have:

a. Intimate and detailed knowledge of the medical and dental plan, especially in regard to evacuation.

b. Detailed knowledge of shock, its prevention and treatment, as well as other particulars referring to transportation of casualties.

c. Prepared themselves to administer intravenous solutions, blood or blood substitutes.

d. Prepared themselves to render treatment for all conditions involving the oral cavity.

2. The regimental dental officer

a. The regimental dental officer, with his dental personnel, lands with the regimental medical officer. He furnishes dental treatment when required during battle operations.

b. He performs such duties in battle or emergencies in connection with the care of the sick and injured as the commanding officer may direct.

c. His duties during evacuation of casualties with the regiment are analogous to those of the division dental officer.

Reports.

The division dental officer keeps the commanding general informed regarding adequacy and efficiency of dental services, and makes appropriate reports and recommendations to or via the commanding general.

AMPHIBIOUS CORPS

ORGANIZATION AND DUTIES.

Corps Special Staff, Dental Section.—The captain in the Dental Corps assigned as the corps dental officer is directly responsible to the commanding general for all professional, technical, and administrative matters in connection with the dental services of the Corps.

He recommends such transfers and employment of dental personnel, both officer and enlisted, and of equipment as may be necessary for maximum utilization of the Corps dental facilities. The Corps dental officer is a special staff officer and bears the same relation to the Corps commander as the division dental officer bears to the division commander. The duties of the Corps Dental Officer are analogous to those of the division dental officer except that he has the added responsibility of the much larger organization.

An officer of the Medical Service Corps with the rank of lieutenant is assigned to assisting the Corps dental officer in the administration of his office. A chief dental technician is assigned to this office to assist the officer of the Medical Service Corps in his duties.

One officer of the Dental Corps with the rank of commander is assigned to the headquarters company of the headquarters and service battalion. His duties primarily are to provide a general dental service for personnel attached to headquarters and service battalion and secondarily to function as assistant Corps dental officer. In the absence of the Corps dental officer, the assistant Corps dental officer assumes the responsibilities of the Corps dental officer.

An officer of the Dental Corps with the rank of lieutenant commander is assigned to the headquarters company of the headquarters and service battalion to assist the assistant Corps dental officer in carrying out his primary duty.

TASK FORCE

ORGANIZATION AND DUTIES.—The organization of the dental service of an amphibious task force varies in size and composition with the number of Marine personnel required for each particular operation as determined by an estimate of the situation.

1. In time of peace the force special staff, dental section, includes the following:

One captain (DC), force dental officer

One lieut. commander (MSC), administrative assistant to the force dental officer, and one chief dental technician.

The force dental officer is directly responsible to the commanding general for all professional, technical, and administrative matters in connection with the dental service of the force. He recommends such transfers and employment of dental personnel, both officer and enlisted, and of equipment as may be necessary for maximum utilization of the force dental facilities. The force dental officer is a special staff officer and bears the same relationship to the force commander as the division dental officer bears to the division commander. The duties of the force dental officer are analogous to those of the division dental officer except that he has the added responsibility of the much larger organization.

The lieutenant commander (MSC) is charged with the administrative work of the force dental officer's office. He is assisted in this work by a chief dental technician.

2. In time of peace one commander (DC) is assigned to the headquarters company of the headquarters and service battalion, primarily to provide a general dental service for personnel attached to this battalion and secondarily to function as assistant force dental officer. In the absence of the force dental officer, the assistant force dental officer assumes the responsibilities of the force dental officer.

3. In time of war one lieutenant commander (DC) is added to the headquarters company of the headquarters and service battalion to aid the assistant force dental officer in his primary duty.

CHAPTER 22

FUNCTIONS OF DENTAL OFFICERS WITHIN SPECIALIZED OFFICES

DENTAL MATERIEL AND LOGISTIC OFFICER.—The interrelationships and channels between the sources of medical and dental supply and the various using activities are discussed in Part I, chapter 4 of this training course, under the heading, "Naval Medical Supply Depots," and again under the chapter on management and technical control. The methods of requisitioning supplies and equipment, the transfer of materiel between stations, and accounting procedures are given full consideration in the chapter on administration, forms, and procedures. The purpose of the discussion presented here is to give the reader an idea of how the dental officers fit into the supply function and what their duties are.

The central controlling and directing agency for medical and dental supplies and equipment in the Navy is the Materiel Division of the Bureau of Medicine and Surgery, through the Naval Medical Materiel Office located in Brooklyn, N. Y. This division has cognizance of all phases of the medical supply function for the Navy. The materiel office, which is commanded by an officer of the Medical Corps, is located within the same building as the Armed Services Medical Procurement Agency and operates in close relationship with this agency so as to insure efficiency and economy in the procurement of all medical and dental supplies and equipment for the Army, Navy, and Air Force.

The Armed Services Medical Procurement Agency is a separate activity, staffed by Army and Navy officers. The commanding officer and executive officer are from different branches of the services and alternate command responsibility periodically with change in personnel. There is an officer of the naval Dental Corps attached to this agency who assists in coordinating the policies of the Navy, as established by the Naval Medical Materiel Office, with those of the Army. He gives advice and direction in professional matters and maintains close liaison with the officers of the Dental Corps attached to the Naval Medical Materiel Office.

The commanding officer of the Naval Medical Materiel Office is assisted by a staff of professional advisors in medicine and dentistry, and by an administrative and clerical force composed of Medical, Dental, Medical Service, and Hospital Corps officers and civil service employees. Some of the functions performed by these officers are described below.

The coordination of matters pertaining to dentistry have been under the surveillance of a dental materiel officer who has been assigned to the Medical Supply Depot, Brooklyn, N. Y., and has collateral duties with the Naval Medical Materiel Office and the Armed Services Medical Procurement Agency.

The determination of the items which are necessary to medical, dental and allied services in the Navy is a duty of the Naval Medical Materiel Office. The selection of these items is made by professional Navy representatives working in teams with parallel Army representatives, and an attempt is made to select items which can be common to both services. Recommendations arising from the field and general practice are given serious consideration. When the revision of the supply catalog was made in 1945-6 on the occasion of establishing joint Army-Navy procurement procedures, the selection of dental items was made by a team of four officers of the Dental Corps—two from each service. These officers were guided by supply lists already in use in their individual service, by recommendations and experiences gained from the field, and by the principles set up by law for the establishment of joint Army-Navy-Air Force procurement.

The coordination and cooperation which exists between the offices mentioned above, makes it difficult to delineate the exact duties of each. The general principle followed is that each service is privileged to select its own items; develop data for cataloging; require certain materiel specifications and design; establish its own requirements; initiate its own procurement; and manage all of the phases which follow receiving the materiel from the manufacturer, and distributing it to the field. In actual practice, however, many of these operations are so well coordinated that service identity does not exist. This applies particularly to such operations as cataloging, establishment of specifications, and testing materiel and equipment. Procurement is strictly a joint procedure.

The officer of the Dental Corps assigned to the Naval Medical Materiel Office has the primary task of assisting in establishing the requirements of the Navy with regard to dental materiel. This can only be done by maintenance of stock records relating to receipts, stock on hand, and issues. He must understand production problems and know the adequacy of the sources of supply in order to allow sufficient time for delivery of supplies and equipment. He must allow for the deterioration of certain items, and for the difficulties involved in handling others. He must be cognizant of changing professional requirements so that he does not recommend the procurement of too great a quantity of those items which are undergoing technical improvement. He must be wary of temporary fads which are sometimes enthusiastically received by the profession, only to be laid aside in a short time for something new.

The dental officer prepares supply-demand reviews for dental items. He initiates procurement of all dental materiel and supervises the receipt, inspection, and location of it as to depot placement. Stock control, primary distribution points, and allowance lists of dental stock is primarily recommended by the dental officer.

It is seen from the foregoing that the duties of the dental officer with regard to dental materiel parallel those of the medical officer in relation to medical materiel, as described in other portions of the instruction course.

DENTAL OFFICERS ENGAGED IN RESEARCH.—Dental research was first undertaken in the Navy when the Naval Dental School was established in 1923, but the first official recognition of this program was granted by the Surgeon General when he approved Research Project X-44 in June, 1942. This project was based on a statistical study of the dental records of 71,000 naval enlisted men.

A dental officer was assigned to the Naval Medical Research Institute in October, 1942 to devote his full time to research problems and, in December of that same year, a naval dental officer was appointed to act as liaison between naval medical and dental research.

Prior to 1942, many dental officers on duty at the Naval Medical School and throughout the Navy had devoted a portion of their time to the investigation of certain dental problems. A recent listing of some of the publications resulting from these investigations by dental officers numbered 61.

Since 1942, several dental officers have been assigned to full time duty in research at the Naval Medical Research Institute, the Naval Dental School, at the National Bureau of Standards, and with the Naval Medical Research Units at Cairo, Egypt, and Berkeley, Cal. Research is also being carried out as an auxiliary function at the Naval Training Center, Great Lakes, Ill. In April, 1948, the Surgeon General authorized the designation of *dental research specialist* to those engaged in this type of work.

The interest which dental officers have demonstrated in research indicates that the goal of naval dental service extends beyond the simple treatment of dental ills and deficiencies. Safeguarding the health of the Navy is the primary goal, but studying the dental problems peculiar to the Navy and helping to advance the sum total of scientific knowledge pertaining to dentistry are important aims.

In order to accomplish this, the Navy supports research units to study various dental problems so that authenticated facts, rather than unfounded theories, may be presented when recommending changes in naval dental policy.

These research units are charged with the following responsibilities:

1. To carry out basic and applied research pertaining to dental science.
2. To serve in an advisory capacity to other facilities in matters pertaining to dentistry.
3. To cooperate with other research facilities in studying problems of mutual interest, and to call upon those other research facilities for aid in carrying out its own research.
4. Further the field of dental research by submitting the results of research for publication in scientific journals, except when such information has been classified.
5. Protect the interest of the Navy by securing patents on inventions resulting from research projects.

In order to encourage other dental officers to carry out research projects in the field, personnel from the dental research facility at the Naval Medical Research Institute, Bethesda, Md., now give a regular series of lectures to student dental officers attending the Naval Dental School. The first course in dental research methods was given in 1939 by an officer attached to the original Naval Dental School.

These lectures seek to show dental officers how to gain reliable information on previous work, how to set up controls, and how to evaluate research data. The need for careful application of biostatistics is emphasized and the manner of preparing and submitting reports on research projects is presented.

The Naval Dental Research Facility also offers advice and suggestions to those dental officers interested in carrying out research on their own initiative.

Qualified dental officers who wish advanced training in research and statistical methods can submit requests to the training sections of the Bureau of Medicine and Surgery for assignment to specific civilian institutions for a course of instruction. Each request of this sort must include the name of the school desired, name and length of the course, an itemized list of charges, and should include a statement from the school to the effect that the dental officer will be accepted for enrollment if the request is approved. Reserve dental officers may request active duty at the Naval Medical Research Institute for training in certain phases of research.

Another feature of the Navy's research program is the assistance offered to civilian institutions through contracts with the Office of Naval Research. Under this program, civilian institutions wishing to pursue a research program of possible benefit to the Navy can request financial assistance. When the proposed research is considered to be of interest and value to the service, and is not a duplicate of similar research conducted by the Navy, or under a Navy contract, funds are granted to the civilian institution. These grants are limited by the budget of the Office of Naval Research, which has maintained a Dental Branch since July, 1947.

In return, the scientist must make periodic reports regarding the progress of his research. This information is then gathered by the Navy, correlated with information received from other sources, and, with the approval of the scientist conducting the supported study, it is disseminated throughout the service for the information of all interested dental officers.

The results of the various research projects are utilized in many ways. Some projects serve to disprove theories which have long been believed while others point the way to more effective use of old materials and methods, or the utilization of new. There have been studies to relate the incidence of caries and other dental disorders with the number of dental officer work years which would be required to remedy these defects. Still other projects concern themselves with the effects of various conditions of the naval service upon the teeth and their surrounding structures.

The Navy is interested in both basic and applied research. In view of this, every effort is made to encourage and assist dental officers who wish to pursue serious research in the field.

At the end of 1948, there were eight naval dental officers devoting full time to dental research and several others spending a major portion of their time in investigating specific problems. Some of the problems being investigated are as follows:

1. At the dental facility of the Naval Medical Research Institute there are nutritional studies being investigated as related to dental



Figure 64.—Examination of rodents teeth for dental caries.

caries. There are, in addition, two problems—one on oral bacteriology, and the other pertaining to the effects of radiation on oral tissues. Other problems in the fields of histopathology, pharmacy, and statistics are under way, and an applied study in the development of a photographic apparatus to record dental structures for identification purposes.

2. At the Naval Dental School there are investigations being carried out to relate clinical experience with certain histological findings. There have been increased facilities for studying pathology, bacteriology, and biochemistry, and investigation in these fields will emphasize clinical and teaching phases of research. There is cooperation between the Naval Dental School and the Research Institute both with regard to personnel, and facilities of their respective laboratories. Such official clinical research has been made possible by the Surgeon General.

3. At the Naval Training Center, Great Lakes, Ill., an authorized research project is under way, involving a study of acute ulceromembranous stomatitis (Vincent's infection).

4. A dental officer is to be assigned to the Naval Medical Research Unit No. 1 at Berkeley, Cal., in somewhat of a training capacity to study certain phases of oral bacteriology.

5. At the Naval Medical Research Unit No. 3 in Cairo, Egypt, studies pertaining to oral manifestations of diseases peculiar to Middle East populations are being investigated.

6. Naval dental officers are assigned to the National Bureau of Standards to learn the methods of testing and improving dental materials, and to take a part in the research projects of that Bureau.

ASSISTANT NAVAL ATTACHE.—Dental officers are sometimes ordered to serve as assistant naval attachés at embassies abroad.

The duties required of such officers vary greatly, but each officer receives detailed instructions from representatives of the Chief of Naval Operations before assuming his post. On reporting for duty, the officer received further instructions from the naval attaché and from the local ambassador.

MILITARY MISSIONS.—Military missions are created to perform specific tasks, usually in some foreign country. When the task assigned has been completed, the mission is usually dissolved.

Dental officers assigned to these missions serve in much the same capacity as an assistant naval attaché, in addition to any dental duties they may be called upon to perform. Dental officers assigned to naval missions will receive full instructions before reporting for duty, and will be advised of the task assigned to the mission as a unit.

DENTAL ASSISTANTS

1. OFFICER PERSONNEL.—Officers of the Dental Corps, of the Medical Service Corps, dental clerks (warrant and chief warrant officers of the Hospital Corps), and enlisted dental personnel are assigned to dental activities.

Dental clerks and officers of the Medical Service Corps are usually assigned only to the larger dental activities, since their duties are primarily administrative in nature. These officers supervise the record offices and property offices, instruct enlisted personnel in administrative duties, and supervise some of the larger prosthetic laboratories of dental activities. In addition to performing the various clinical and administrative duties of a dental activity, these officers are also called upon to inform the dental officer in charge of a dental department or the commanding officer of a dental activity regarding changes in naval policy that would affect the dental facility.

2. ENLISTED PERSONNEL.

a. *Rating groups.*—The enlisted dental assistants are divided into seven groups, or rates. These rates are as follows:

Chief dental technician (DTC)—The highest enlisted rating.

Dental technician, first class (DT1).

Dental technician, second class (DT2).

Dental technician, third class (DT3).

Dentalman (DN).

Dental apprentice (DA).

Dental recruit (DR)—The lowest enlisted rating.

It is the enlisted assistant with whom the average officer of the dental corps will have the most contact. These are the men who will assist at the chair; man the prosthetic laboratory; repair the dental equipment; and maintain most of the dental records.

b. *Technical groups.*—Without regard to rate, enlisted assistants are divided into three groups:

(1) Dental technicians, general—men trained to assist the officer of the Dental Corps at the chair in the practice of general dentistry, with practical knowledge of minor prosthetic procedures, dental office administration and the maintenance of dental equipment.

(2) Dental technicians, prosthetic — men trained in major prosthetic dental procedures, with some knowledge in assisting the officer of the Dental Corps in the practice of general dentistry, dental office administration, and the maintenance of dental equipment.

(3) Dental repairman—men highly trained in maintaining and repairing items of dental equipment, with some knowledge in assisting the officer of the Dental Corps in the practice of general and prosthetic dentistry, and dental office administration.

3. OFFICER-ENLISTED RELATIONSHIPS.

a. *Dental technicians, general.*—The closest association between officers of the Dental Corps and enlisted technicians is usually with dental technicians, general, from the rating of dentalman to and including that of dental technician, second class. This group consist of men who directly assist the officer of the Dental Corps at the chair in operative, surgical, and prosthetic procedures, maintain the appointment book and dental records, sharpen cutting instruments, service and maintain the dental unit and motor driven instruments, clean the office spaces, take and develop roentgenograms, provide dental prophylactic service, and administer routine treatments under the supervision of a dental officer. These men also are expected to be capable of assisting the dental officer in taking impression and similar prosthetic procedures, but are not expected to perform complicated prosthetic operations.

b. *Dental technicians, prosthetic.*—Prosthetic technicians, rating from dentalman to and including chief dental technician usually devote all their time to prosthetic duties and are assigned to activities authorized to practice prosthetic dentistry. They are the men who carry out the procedures necessary to transform an impression into a finished prosthetic appliance. In some activities, specializing in difficult prosthetic cases, some technicians may be assigned to assist dental officers in the dental prosthetic operating room in order to gain a more thorough knowledge of the problems presented in complicated cases.

c. *Dental repairmen.* — Dental repairmen, from dentalman to chief dental technician, are usually assigned to large centrally located dental activities. These men are charged with the responsibility of maintaining dental equipment and effecting such repairs as may be necessary. As a rule, these men make periodic visits to the smaller dental activities in the vicinity to service dental equipment. A further duty of this group is to instruct general and prosthetic technicians regarding the proper methods of caring for dental equipment.

In time of war or national emergency, qualified prosthetic technicians and dental repairmen are sometimes brought directly into the service to serve in their specialties. The normal procedure, however, is to first train all enlisted candidates for the dental department in the techniques required of the general technician. Upon graduation from a general school, they are ordered to ships or stations to gain practical experience in dental procedure and in the administrative duties of a dental technician.

A general technician may later submit a request for specialized training in prosthetic or repair techniques, but such requests must carry an endorsement by an officer of the Dental Corps stating that the technician has exhibited an aptitude for the course. This policy ensures that all enlisted dental personnel will receive training in basic training techniques, and reduces the number of failures at the specialized schools by eliminating those who lack the special qualifications and aptitudes demanded by the courses.

d. *Dental recruits—dental apprentices.*—No mention has been made of the role played by dental recruits and dental apprentices, since the average officer of the Dental Corps will have little contact with these groups. Dental recruits are men who selected the dental department when they enlisted in the Navy. Most of these men have had little or no training in dental procedures, and hold this rate only while undergoing the period of boot training required

of every recruit in the Navy. Few, if any, men of this rate perform duties in a naval dental office.

Dental apprentices are one rate higher than dental recruits, receiving this rate when admitted to a class A dental technicians school, or shortly after entering the naval service. Dental apprentices in school receive the basic training in dental theory and procedures to fit them for duty in a dental activity. These men receive training which would enable them to pass the theory examination for the higher rates, but they lack the practical experience needed to apply this theory. On graduation from the naval dental technician school, dental apprentices are assigned to dental activities throughout the service. It then becomes the duty of the dental officers and of the higher rated enlisted men to aid each dental apprentice in his efforts to learn the practical appication of the theory he has learned.

As a general rule, these men soon advance to the rating of dentalman when they prove that they are capable of performing these duties effectively.

e. *Dental technician, first class—chief dental technicians.*—Dental technicians, first class and chief dental technicians usually drift away from active dental duties. Instead, most of these men are assigned to larger activities where they devote all or most of their time either in an administrative or supervisory capacity, or instruct lower rated men in administrative and technical duties. The great majority of the Navy's dental clerks are selected from qualified first class and chief dental technicians.

Although the bulk of the administrative duties in the larger dental activities falls upon the shoulders of medical service corps officer, dental clerks, chief dental technicians, and dental technicians, first class, the lower rated men must also become familiar with Navy admin-



Figure 65.—Visual aids for training dental technicians.

istrative procedures. Some small dental departments will have but one officer of the Dental Corps and one dental technician who must assume the responsibility of executing forms, reports and administrative procedures in the same manner, but perhaps to a lesser degree than far larger dental activities.

It is therefore apparent that a junior officer of the Dental Corps, and his assistant, who may be a lower rated dental technician, must be versed sufficiently in dental administration to carry out the obligations of a dental department. The administrative experience gained at these small activities proves invaluable as men advance in rank or rate and are required to assume greater responsibility in supervising larger and more complex dental activities.

4. ENLISTED TRAINING PROGRAM.

a. *Class A schools.*—Upon completion of recruit training, selected enlisted personnel are admitted to class A schools for further training in the basic dental procedures for the rating of *dental technician, general.* Personnel selected for these schools must have special aptitude for this training. Such aptitude is judged from physical characteristics, scores on Navy tests, civilian occupation, previous training, experience, hobbies, and interests.

Class A.—Schools designated to cover the ground work for general service ratings. The curricula for class A schools include all technical qualifications required for petty officer, third, and second class.

Dental technician, general.—Subjects included in this course are: histology, pathology, anatomy, roentgenology, dental materials, oral hygiene, materia medica, odontography, bacteriology, oral surgery procedures, property and accounting, and typing.

b. *Class C schools.*—In addition, qualified dental technicians are often assigned to class C schools for advanced specialized training, for the rating of *dental technician, prosthetic,* and the rating of *dental technician, repairman.*

Class C.—Schools designated to train enlisted personnel in particular qualification or skill which does not cover the full requirements for a general service rating. The curricula for these schools are designed around the special qualification or skill which is desired.



Figure 66.—Dental technicians in training in a prosthetic laboratory.



Figure 67.—Training of dental technicians, repairmen.

Dental technician, prosthetic.—Subjects included in this course are: wax and kindred material, plaster room procedures, denture repair, denture materials, finishing procedures, crown and bridgework, partial denture techniques, articulation of teeth, odontography, dental technology, and oral anatomy.

Dental technician, repairman.—course leads to rating of dental repairman, and is the study of the maintenance and repair of equipment used by the dental activities of the Navy. Students are expected to have aptitude for electricity, machine and lathe work, and other mechanical procedure.

These courses are usually of six months' duration and consist of didactic and practical instruction. On graduation, the student receives a certificate as a technician in the course which he has successfully completed.

Schools for the training of naval dental technicians at the time this course was prepared (1949) were located as follows:

Naval Training Center, San Diego, Cal. (Class A.)

Naval Training Center, Great Lakes, Ill. (Class A.)

Naval Dental School, National Naval Medical Center, Bethesda, Md. (Class A and C.)

Section III

FUNCTIONS OF MEDICAL SERVICE CORPS AND HOSPITAL CORPS OFFICERS

INTRODUCTION

The scope of this chapter is to provide information on the duties and functions of the Medical Service Corps, and to explain the relation of the corps to the medical department organization.

The Medical Service Corps was established by an act of Congress (1947) as a staff corps within the Medical Department of the Navy. The grades run from ensign to captain. It is the outgrowth of a long-felt need for a permanent commission corps of specialists to complement the purely professional functions of the Medical and Dental Corps and to provide the Medical Department with highly trained personnel in fields other than medicine and dentistry.

In view of the diversified character of the duties and functions of the officers of the Medical Service Corps, for the purpose of this discussion the corps will be divided into four general categories: Administration and Supply; Allied Sciences; Pharmacy; Optometry.

In the first category are those officers who, by virtue of many years of practical experience and technical training in the medical department of the Navy have been thoroughly inculcated and have acquired special skills in administration, naval doctrine, procurement, supply, maintenance, personnel, commissary management, and in other aspects of administration required for efficient operation of naval medical facilities. Procurement of officers of this classification is by the appointment of qualified warrant and commissioned warrant officers of the Hospital Corps to the commissioned rank of ensign, medical Service Corps.

The allied sciences branch consists of officers especially trained in the sciences of chemistry, bacteriology, serology, virology, public health, entomology, and in other scientific pursuits allied to medicine.

Officers in this category are procured direct from civilian life. Applicants must be graduates of accredited schools of pharmacy, optometry, or other schools or colleges with degrees in sciences allied to medicine or such other degrees as may be approved by the Surgeon General of the Navy.

Original appointments to the Medical Service Corps are normally made in the grade of ensign; however the Surgeon General may approve original appointment in the rank of lieutenant (j.g.) in the case of applicants having a doctorate in his or her specialty.

An appointee in the Medical Service Corps must be a citizen of the United States, between the ages of 21 and 32, and must establish his or her mental, moral, and professional qualifications to the satisfaction of the Secretary of the Navy.

CHAPTER 23

FUNCTIONS OF MEDICAL SERVICE CORPS OFFICERS

FUNCTIONS OF THE MEDICAL SERVICE CORPS, ADMINISTRATION AND SUPPLY

The functions of the officers of this corps, generally speaking, are to aid and advise the medical and dental officer in the performance of the nonprofessional duties, for the efficient operation of the many medical and dental activities of the Medical Department. These duties are divers, and require special skills that are only attained after many years of naval indoctrination and practical experience. As the medical officers' alter ego, his duties are diversified and often very complex. He may be assigned to assist the prospective commanding officer in supervising the construction phases and the fitting out of a large hospital. In such capacity, he must be thoroughly familiar with the procedures necessary to successfully carry out such a difficult undertaking. This is only one of the many functions of the administration and supply personnel.

It was a recognition of the many complex and varied problems that confronts the administration and supply personnel that brought about the establishment of the U. S. Naval School of Hospital Administration. This school is unique in the annals of educational institutions in that it offers, exclusively, those subjects dealing with the science of hospital administration. The course is of ten months' duration. In keeping with modern trends the curriculum is general in character, but it is sufficiently flexible to permit emphasis on such varied subjects as accounting, maintenance, commissary, and personnel management.

The personnel of the Medical Service Corps Administration and Supply function in every phase of management and administration of the medical department, both ashore and afloat.

In the central agency of the Medical Department, the Bureau of Medicine and Surgery, the Medical Service Corps, administration and supply officers' assist and have administrative responsibilities in the direction of all medical services of and for the Navy and Marine Corps, initiating, coordinating, and integrating the policies, standards, and practices of the department, and directing activities concerned with its personnel, materiel, and public works.

Specifically, the individual functions of the medical corps officers, administration and supply, in the Bureau of Medicine and Surgery are:

OFFICE OF SURGEON GENERAL.—The Medical Service Corps officer assigned to this duty acts as administrative assistant to the Surgeon General.

RED CROSS LIAISON OFFICE.—This office is under the Deputy and Assistant Chief of the Bureau. The Medical Service Corps officer so assigned maintains an office in the Headquarters of the American Red Cross. He has the responsibility of maintaining liaison (between the American Red Cross and the Bureau of Medicine and Surgery) on all matters pertaining to the Bureau and the Medical Department as a whole.

GENERAL INSPECTOR MEDICAL DEPARTMENT.—The duties of the Medical Service Corps officer assigned to this office will vary with the individual General Inspector. In general his function is to assist the General Inspector in the administrative phases of the office. He prepares analytical inspection reports and, in field inspections, makes physical checks on the operations of the administrative divisions and assists the general inspector to prepare the critique on the facility inspected.

GENERAL INSPECTOR DENTAL SERVICE.—The duties of the Medical Service Corps officer assigned to this office are essentially similar to those described above.

FINANCE DIVISION.—A senior Medical Service Corps officer acts as Administrative Assist-

ant to the Chief of the Division. His functions, in general are:

1. Supervision of personnel assigned to the Finance Division.

2. Administering of a central stenographic pool for the preparation of correspondence, reports, and statements of the division.

3. Receiving of incoming and outgoing mail, other than classified, and direction of internal routing, follow-up, and disposition.

4. Responsibility for the maintenance of a correspondence file for the division.

Audit Branch.—The Medical Service Corps officer assists in auditing appropriation, cost, and property reports from Medical Department activities; he enforces correct accounting and reporting and the proper use of funds, services, supplies, and equipment, and conducts financial research in auditing.

The branch consists of a hospital audit section, a ship's and station audit section, and a medical stores section.

1. Budgetary Estimates Section.—In the budgetary estimates section the Medical Service Corps officer assists in preparing plans and data for the annual Medical Department budget estimates, and requests (for submission to the Navy Department, Bureau of the Budget, and Congress) for supplemental appropriations. He obtains, from other divisions of the Bureau for estimating purposes, total estimates of financial requirements and the necessary substantiating data.

He coordinates the processing of annual requests (from Medical Department activities) for allotments of funds, and develops procedures for the preparation of annual field estimates.

He collaborates with the planning division in the preparation of the Public Works budget for Medical Department-sponsored projects of the Bureau of Yards and Docks budget.

2. Reimbursement and Subsistence Section.—The Medical Service Corps officer assists in preparing all claims for reimbursements to Medical Department appropriations for materials and services furnished to other agencies. He follows-up to see that all payments are received, and compiles forecasts, reports, and returns involving reimbursements to medical department appropriations.

3. Civilian Allowances Section.—Here, also, the Medical Service Corps officer has a specific function in preparing civilian personnel budget estimates for Medical Department field activities.

He develops quarterly estimates for civilian personnel requirements for each field activity (for submission to the Office of Budget and Reports); authorizes and maintains control of civilian personnel allowances and ceilings in the field; maintains records relating to payment of and complements for field civilian personnel; and utilizes workload, expenditure, and related data for purposes of analysis and justification of civilian personnel requirements, involving compilation and comparison of military and civilian complements to total workloads.

Accounting Branch.—In this branch the Medical Service Corps officer has the important task of maintaining complete financial records for the Bureau and the Medical Department, including prescribed appropriation records, allotment control records, and expenditure data records. Also, he prepares current reports as prescribed and as necessary for fiscal management and budget purposes, issues the necessary accounting instructions, and takes action to effect reimbursements to appropriations which are under the cognizance of the Bureau.

1. Allotment Section.—The Medical Service Corps officer assists in maintaining accounting controls over allotments granted to Medical Department activities. He develops and issues instructions covering accounting methods, procedures, and the forms and reports to be submitted; maintains accounting records (based on reports) on the status of allotments and the use of allotted funds; prepares media for posting allotment data to appropriation records; and prepares current reports on allotments and use of allotted funds.

2. Appropriation and Bookkeeping Section.—The Medical Service Corps officer's functions in this office are to supervise the appropriation accounting system for the Bureau and the Medical Department, to maintain records on commitments, contracts, project orders, informal obligations, and available balances, and to prepare current reports relating thereto. Also, he reviews all documents being processed and institutes necessary corrective action; recon-

ciles Bureau and Medical Department records with those maintained by the Bureau of Supplies and Accounts; reviews all Navy accounting manuals and letters, and correlates and issues instructions and procedures on all matters affecting appropriation accounting within the Medical Department; and, finally, he maintains liaison with Navy accounting offices.

Naval Reserve training project officer.—The Medical Service Corps officer assists the Naval Reserve training project officer in planning and developing training material for commissioned personnel of the Reserve components of the Medical Corps, Dental Corps, Medical Service Corps, Nurse Corps, and Hospital Corps.

Specifically, he is to:

1. Prepare, for publication by the Bureau of Naval Personnel, study courses, literature, and other training material covering those aspects of professional and technical training peculiar to the naval service for commissioned personnel of the various Medical Department Reserve Corps.

2. Plan the distribution of training material in conjunction with the Bureau of Naval Personnel.

3. Determine the specific number of credits to be allowed for each course, in conformance with the basic pattern of unit credits established by the Bureau of Naval Personnel.

4. Maintain liaison with the Naval Reserve Division, other interested divisions in the Bureau, and the Bureau of Naval Personnel.

PUBLICATION DIVISION. — Medical Service Corps officers assigned to this division function as assistants to the Chief of the Division in the selection of articles and illustrations for printing. They help to prepare correspondence and maintain the necessary relations with authors contributing to naval publications, assist in the collection of material for the medical history and museum branch, and help with the training material for U. S. naval personnel.

PUBLIC RELATIONS DIVISION.—Medical Service Corps officer assigned to this division assists the Chief of the Division in planning public relations programs, and in the integrating and scheduling of a regular flow of news, information, and photographs to the general public through such media as press, radio, scientific publications and other periodicals, motion pictures, etc.

Security Branch.—A Medical Service Corps assigned to this branch enforces the existing Bureau orders and regulations relative to security, fire prevention, and emergencies, recommending and initiating new measures when necessary. He issues and controls personnel and property passes. He controls the keys to rooms and buildings assigned to the Bureau. He arranges for the destruction of classified material, posts fire bills, and enforces parking regulations. The information and transportation service is also under his direction.

PROFESSIONAL DIVISION.—Medical Service Corps officers are assigned to this division to assist in administrative matters and help to formulate the various training programs under its direction.

PHYSICAL QUALIFICATIONS AND MEDICAL RECORDS DIVISION.—Medical Service Corps officers are assigned to this office chiefly to maintain the files and to preserve medical records. They handle correspondence requesting copies of these records, and on certain other closely related subjects.

PLANNING DIVISION.—Medical Service Corps officers assist the division chiefs in both the general planning, war plans, and logistic support sections. They help to prepare estimates of facilities, materiel, and personnel required to support each plan. They also assist in maintaining the G-component section of the catalogue of advanced base components, the advanced base initial outfitting lists, and the advanced base outfitting lists (abridged).

MATERIEL DIVISION.—A Medical Service Corps officer acts as an administrative assistant to the division chief. He supervises and administers all matters relating to personnel, maintenance, communications, correspondence, and files within the division. Other Medical Service Corps officers are assigned to assist medical officers in the administrative procedures peculiar to the division.

DENTAL DIVISION.—A Medical Service Corps officer is assigned to this division in either of the following sections: Materiel, Finance, Personnel. In the personnel section his functions are to assist the division chief in developing, evaluating, coordinating the work of the dental

division. He makes recommendations on personnel policies and needs for the dental personnel, Medical Service Corps, warrant and chief warrant officers, Hospital Corps (dental clerks), dental technicians, and nonrated dental personnel. A Medical Service Corps officer assigned to the materiel and finance section functions as an administrative assistant. He supervises personnel assigned to this section, prepares correspondence, reports, and statements of the division. Handles incoming and outgoing mail, other than classified, and directs internal routing, follow-up, and disposition. He is also responsible for the maintenance of a correspondence file.

RESEARCH DIVISION.—A Medical Service Corps officer functions as an administrative assistant to the chief of the division.

PERSONNEL DIVISION.—One of the most important functions of the Medical Service Corps is performed in the Personnel Division. Their duties in the many components of the Personnel Division are, specifically, to develop, evaluate, coordinate, and advise on naval personnel policies and needs of the Medical Department.

In the office of complement planning and control their functions are to:

1. Study the naval personnel needs for all Medical Department activities.

2. Plan, recommend, coordinate, and control the naval personnel complements and allowances for the Medical Department.

3. Advise each detailing office — Medical Corps, Medical Service Corps, Hospital Corps, and Nurse Corps (as far in advance as possible) of any changes regarding naval personnel requirements or any action which will affect the current requirements, complements, or allowances.

4. Maintain close liaison with the Complement Control Section of the Bureau of Naval Personnel and the Planning Division of the Bureau of Medicine and Surgery.

5. Maintain liaison with all interested divisions in the Bureau.

In the Hospital Corps enlisted branch, Medical Service Corps officers will evaluate, advise on, and administer personnel programs and policies, including procurement, assignment, distribution, performance, personnel qualifications, historical records, files, and training standards and needs, (as these relate to enlisted personnel in the Hospital Corps) and will administer the Naval Reserve program for Hospital Corps enlisted personnel.

Specifically:

1. Plan recruitment programs for Hospital Corps enlisted personnel in liaison with the Bureau of Naval Personnel.

2. Recommend policies covering advancement, changes in status, and discharges of enlisted personnel.

3. Review and recommend action on all enlisted personnel performance reports.

4. Prepare, revise, and evaluate the curricula for basic and advanced training courses of Hospital Corps schools and technician training courses.

5. Control personnel quotas for each course, and maintain qualification records on all technicians.

6. Maintain liaison with other divisions in the Bureau, other bureaus and offices of the Navy Department, and professional training associations and educational officials, in all matters relating to the training of enlisted personnel of the Hospital Corps.

A Medical Service Corps officer also functions in the Distribution and Accounting Section, a subdivision of the Hospital Corps enlisted branch. His duties are to:

1. Recommend complements.

2. Distribute enlisted personnel to all naval commands.

3. Maintain personnel accounting and allowance records for each naval activity and the Navy Department, and professional training

4. Assign personnel to and from technical and advanced Hospital Corps training courses.

In the office of Records, Statistics, and Archives Section the Medical Service Corps functions are to:

1. Maintain custody of all active and inactive records for the enlisted personnel of the Hospital Corps.

2. Prepare and maintain personnel jackets and a card index of all enlisted personnel, including ex-hospital corpsmen.

3. Develop and maintain personnel statistical records for operational purposes.

4. Maintain the historical archives of the enlisted Hospital Corps branch.

MEDICAL SERVICE CORPS BRANCH.—A senior Medical Service Corps officer directs the Medical Service Corps branch and is responsible for the administration of all matters pertaining to Medical Service Corps officers (Regular Navy and Naval Reserve), temporary officers of the Hospital Corps, and commissioned warrant and warrant officers of the Hospital Corps; and shall study, evaluate, advise, and make recommendations on personnel needs and policies (including procurement, assignment, distribution, disposition, and personnel qualifications as they relate to these officers).

Specifically:

1. Maintain a complete jacket record on each officer of the Medical Service Corps, temporary commissioned officer of the Hospital Corps, and commissioned warrant and warrant officer of the Hospital Corps (including regular, reserve, active, inactive, retired, and ex-officers), until the permanent status of each is determined.

2. Maintain records of seniority, performance, and specialty of each of these officers, and the activity to which each is assigned.

3. Determine requirements of the naval service for the needs of these officers, and make recommendations regarding procurement.

4. Recommend types and contents of special training courses for these officers and the number to be assigned each course.

5. Make recommendations regarding legislation, changes in Navy Regulations, Bureau manuals, and other official publications pertaining to these officers.

6. Maintain liaison with other divisions in the Bureau (and other bureaus and offices of the Navy Department) in all matters relating to these officers.

In the Bureau Naval Personnel office, in the Bureau of Medicine and Surgery, the Medical Service Corps officers functions are to:

1. Control and revise officer and enlisted allowances for the Bureau, including the establishment and cancellation of billets.

2. Procure enlisted personnel for the Bureau and detail them within the Bureau.

3. Refer requests for assignments of enlisted personnel in the Bureau to the Administration Division for the purpose of coordinating the proposed enlisted billets with the existing civilian complements.

4. Prepare all on-board and allowance reports regarding Bureau naval personnel, except those concerned chiefly with flight personnel.

5. Maintain liaison with the U. S. naval barracks in such matters pertaining to enlisted personnel as: processing of receipts and transfers, leave and liberty, advancement in rating, mess detail rotation, assignment of quarterly marks, and recommendations for disciplinary action.

6. Maintain a location file of all naval personnel on duty in the Bureau.

7. Maintain a file on all officer qualification record jackets and leave records.

8. Maintain files showing memberships of BuMed personnel on various Bureau, Navy Department, and interagency boards and committees.

Medical Service Corps officers are assigned functions in the Bureau of Naval Personnel as follows:

1. Planning and control division: as advisers on matters pertaining to Medical Department personnel.

2. Staff personnel section: act as liaison in transfers, promotions, and discharges of Medical Department personnel.

THE NAVAL MEDICAL SUPPLY DEPOTS

The importance of the functions of the Medical Service Corps officers in the naval medical supply depots is second only to those exercised in the Bureau of Medicine and Surgery.

ADMINISTRATION DIVISION.

The administrative assistant is responsible to the commanding officer, through the executive officer, for proper direction of depot functions assigned to the Administration Division. He is responsible through the heads of the sections and branches of the Administration Division for: preparation and maintenance of advance yearly estimates of expenditures; finance and property records, accounts, and reports; execution of all required naval and civil personnel actions and reports; procurement and custody of depot maintenance materials; repair and upkeep of buildings, grounds, and

appurtenances; promulgation and enforcement of safety regulations and instructions; control of official correspondence, and maintenance of general files.

The Administration Division, subject to depot activity, is comprised of four branches, namely:

1. Finance and Property Branch.
2. Office Services Branch.
3. Personnel Branch.
4. Maintenance and Transportation Branch.

FINANCE AND PROPERTY BRANCH.—The Finance and Property Officer coordinates, supervises, and is responsible to the administrative assistant for proper accomplishment of all depot functions assigned to the sections of the Finance and Property Branch.

The finance and property branch is comprised of two sections: the finance section and the property section.

(1) *Finance Section.*—The Finance Section personnel are responsible for: preparation of annual and other estimates of expenditures; maintenance of allotment control records; preparation of annual and specific requisitions for depot maintenance; procurement of all supplies, services, and equipment required in depot maintenance; procurement, as authorized, of medical and dental stores for reissue; maintenance of procurement records; preparation of vouchers, bills, and invoices as required; preparation of civil payrolls; preparation, maintenance, and all matters pertinent to civil employee time, leave, and retirement records; maintenance of record of station projects and standing job orders, including preparation of completion reports.

Other duties of this section include: preparation of all required financial statements, reports, records, and special financial statistical reports; preparation of correspondence pertinent to depot financial matters; audit of vouchers, maintenance stores invoices, payrolls, statements of charges and credits, and payroll summaries; maintenance of files of all financial transactions, reports, returns, directives, statistical records, and correspondence required of the Finance Section; maintenance of the BuSandA *Manual* and other manuals, handbooks, pamphlets, and circulars required in the Finance Section; and performance of related duties as required.

(2) *Property Section.*—The Property Section personnel are responsible for: maintenance of all required depot property records, including supplies ledger, equipment ledger, and plant account records; initiation of requisitions for maintenance materials as required; receipt, inspection, storage, care, custody recording, transfer, and disposition of maintenance materials; preparation of all required property records and reports; maintenance of files of property reports, records, correspondence, and other data pertinent to the Property Section; maintenance of manuals, stores catalogs, pamphlets, and circulars required in the Property Section; and performance of related property duties as required.

OFFICE SERVICES BRANCH.—The supervisor of the Office Services Branch coordinates, supervises, and is responsible to the administrative assistant for proper accomplishment of all duties assigned to sections of the Office Services Branch. The Office Services Branch is comprised of two sections: the Correspondence and Communication Section and the Mail, File, and Record Section.

Correspondence and Communication Section.—The Correspondence and Communication Section personnel are responsible for: preparation of general correspondence pertinent to depot administration; preparation, receipt, release, distribution, and filing of dispatches; maintenance of custody of classified correspondence in accordance with current Navy Department orders and instructions; reproduction of multiple copy correspondence and printed matter as required; maintenance in a current manner of the office copy of Navy Regulations, General Orders, *Manual* of the Medical Department, Communication Instructions, and other manuals, circular letters, and instructions required by the Correspondence and Communication Section; and performance of related clerical duties as required.

Mail, File, and Record Section.—The Mail, file and Record Section personnel are responsible for: maintenance of the depot general files; receipt, time-stamping, routing, distribution, and follow-up procedures of incoming correspondence; collection and preparation for mail-

ing of outgoing correspondence; maintenance of depot messenger service; receipt, issue, custody, and recording of use of stamps for posting first-class mail matter; maintenance of the office copy of the Navy File *Manual*; and performance of related mail and file duties as required.

PERSONNEL BRANCH.—The Personnel Officer coordinates, supervises and is responsible to the Administrative Assistant for proper accomplishment of all duties assigned to sections of the Personnel Branch.

The Personnel Branch is comprised of two sections: the Military Personnel Section and the Civilian Personnel Section.

Military Personnel Section.—The Military Personnel Section is responsible for: maintenance of records and accounts of officers and enlisted naval personnel; initiation, preparation, and maintenance of all military personnel reports and returns required by the Navy Department and other cognizant authorities; the assignment of enlisted personnel to duty as directed by the Executive Officer; preparation of watch, detail, and liberty lists for enlisted naval personnel; the initiation and preparation of all correspondence relative to naval personnel matters; proper maintenance of office copies of Navy Department and other manuals, pamphlets, and directives, including BuPers *Manual,* naval courts and boards, navy travel instructions, uniform regulations, BuPers circular letters, and directives required in the Military Personnel Section; and performance of related personnel duties as required.

Civilian Personnel Section.—The Civilian Personnel Section is responsible for: all civilian personnel actions, including recruitment, placement, employment, transfer, promotion, demotion, compensation commission matters, retirement, separations, and deaths; all matters pertinent to income tax and war bond deductions; employees' services to civilian and military personnel, including housing and rationing matters (if applicable), transportation facilities, restaurant services, hospitalization plan, the depot newspaper, and preparation and revision of a depot handbook for civilian personnel; personnel identification procedures.

Also, for all matters pertinent to selective service status of employees; administration of efficiency rating systems for civilian employees; maintenance of records and performance of clerical procedures incident to the beneficial suggestions program; initiation and preparation of all civilian personnel statistical reports required by the Navy Department and other cognizant authorities; maintenance of files and records incident to operation of the Civilian Personnel Section; maintenance of naval civilian personnel instructions; and performance of related civilian personnel duties as required.

MEDICAL SERVICE CORPS OFFICER IN A NAVAL HOSPITAL

ADMINISTRATIVE ASSISTANT.—The administrative assistant to the commanding officer is a senior officer of the Medical Service Corps. In the absence of the executive officer he is the direct representative of the commanding officer, from whom his orders shall be considered as emanating. As the administrative assistant he shall:

1. Have cognizance of and act for the commanding officer in matters pertaining to the business management of the hospital, keeping the commanding officer fully advised concerning all matters of importance upon which he has acted.

2. Supervise the mail and establish and maintain records and files as may be directed; be responsible for proper receipt and routing of all incoming official correspondence; assure prompt action on all correspondence of the hospital, including routing, indexing, tracing and follow-up, proofreading, duplicating, printing, and filing; be the custodian of the commanding officer's personal and confidential files.

3. Be responsible for arrangement of matters pertaining to official visits, ceremonies, salutes, parades, and entertainments in which the commanding officer is to participate.

4. Conduct inspections of spaces and facilities at stated periods, or at such times as may be specifically required by the commanding officer.

5. When directed by the commanding officer he will officiate as voting officer; disseminate and publicize throughout the command information regarding election dates and States voting procedures; provide absentee ballot application forms to personnel requesting them;

administer and attest oaths, and safeguard the integrity and secrecy of ballots.

6. When so assigned he may act as a saving bond officer; disseminate and publicize throughout the command information regarding savings bonds, and instruct personnel—naval and civilian—in methods of purchase.

PUBLIC INFORMATION OFFICER.—The public information officer for a naval hospital assists the commanding officer, who has the responsibility for public relations as a command function, on matters of public information pertaining to all activities of the hospital. He will also:

1. Arrange for and supervise press, radio, and motion picture coverage of all official ceremonies, events, and incidents within the hospital.

2. Endeavor to maintain cordial relations with the general public and all press, motion picture, radio, and photographic agencies, by providing an official source of authoritative information concerning the hospital; thus relieving other officers and departments from inquiries from the general public.

3. Receive all foreign visitors, arrange for their introduction to proper authorities, plan their tour of such activities as the visitors may have expressed interest in visiting, and be responsible for clearance of foreign visitors with the office of Naval Intelligence, Navy Department, and for submittal of required reports by the individual activities visited.

FINANCE OFFICER.—This officer is responsible for the proper and efficient management of the finance division, formerly called property and accounting. As the finance officer, his functions are to:

1. Advise and assist the commanding officer on all matters of finance, property, and supplies pertaining to the hospital.

2. Direct inventory of all Medical Department equipment in storage (and in use under custody) at least once annually, and as often in addition thereto as he and the commanding officer may consider necessary for maintenance of accurate location records.

3. Be responsible for proper keeping of accounting records and preparation of returns required by the Bureau of Medicine and Surgery, Bureau of Supplies and Accounts, commandant, and other competent authority. Keep the commanding officer informed of status of allotments, prepare periodic summary of unobligated balances, and compile annual estimates of expenditures.

PERSONNEL OFFICER.—The personnel officer directs and supervises the personnel division which embraces the functions of both naval personnel office and civilian personnel office. As naval personnel officer, his functions are to:

1. Have custody of and responsibility for the security of all personnel records—officers and enlisted personnel—of the hospital, and for the current maintenance of such records; be responsible for the prescribed personnel reports and returns and all correspondence pertaining thereto.

2. Be familiar with personnel policies, directives, regulations, and instructions issued by the Bureau of Naval Personnel, the Bureau of Medicine and Surgery, Navy Department, and the commandant.

3. Formulate policies and procedures for, and supervise training of enlisted men of the hospital corps.

4. Keep himself informed of government insurance laws, provisions of G. I. Bill, civil readjustment procedures, and educational services, and submit recommendations to the commanding officer.

5. Endorse orders of officers for assignment to quarters; prepare letters for assignment to married officers, and for civilian and enlisted quarters on the station, and see that the disbursing officer is kept informed as to their current occupancy.

6. Assume responsibility to the commanding officer for the efficient management of civilian personnel and keep him informed in matters pertaining to civilian personnel administration in all departments; have custody of and responsibility for the security of all civilian personnel records, and for the current maintenance of such records, reports, returns, and all correspondence pertaining thereto.

7. Advise and assist the commanding officer, heads of departments, and other supervisors of civilian employees in the handling of grievances and complaints, disciplinary matters, re-

lations with employee groups, and in the correct interpretation of all laws, regulations, and Navy Department directives affecting civilian employees.

8. Maintain liaison with the Civil Service Commission.

COMMISSARY OFFICER.—1. The commissary officer is responsible for all commissary stores and provisions, and for equipment pertaining to the commissary.

2. He is in charge of all personnel assigned to commissary activities.

3. Upon receipt of stores and provisions, he verifies their weights, conditions, and compliance with specifications and contract requirements.

4. Exercises strict supervision over upkeep, cleanliness, and food handling in the galleys, mess halls, storerooms, diet kitchen, and all other commissary activities.

5. Prepares the daily receipt and expenditure vouchers, and posts them in the commissary ledger.

6. Supervises monthly inventory of stores.

7. Keeps himself informed of regulations and instructions governing the procurement, inspection, storage, and issue of provisions and the proper method of obtaining provision on contract.

MAINTENANCE OFFICER.—A Medical Service Corps officer is frequently assigned as maintenance officer in a naval hospital. He is responsible for the efficient operation of the utility system, the care, repair and supervision of transportation equipment, and the upkeep of land and buildings. He has charge of all skilled and common labor employed in the maintenance division, and plans the daily work program for the maintenance force. He approves and classifies work and repair requests. He keeps a record of all work assignments and computes the cost of material and labor. He inspects and supervises installation of fixed equipment, repairs, replacements, alterations, and/or installation of utility systems, painting program, and the upkeep of grounds and gardens.

In addition to the above he is usually assigned additional duties as security officer, transportation officer, and laundry officer.

LEGAL ASSISTANCE OFFICER. — A Medical Service Corps officer, with a legal background, functions as a legal assistance officer. As such, he advises the commanding officer on all legal matters pertaining to the hospital and to the Navy as a whole, particularly on problems with medico-legal aspects. He should also be familiar with established civil and military court procedure and supplemental decisions and instructions published from time to time by the office of the Judge Advocate General, Navy Department.

In addition to the above, Medical Service corps officers are often assigned collateral duties, such as communications officer, civil readjustment officer, welfare and recreation officer, and other work of an administrative nature.

In the larger hospitals each division officer may have Medical Service Corps officers as assistants. To illustrate, the finance officer may have assigned to his division three assistants, one acting as procurement officer, one as an accounting officer, and one as a property officer.

THE NAVAL DISPENSARY.—The functions of the Medical Service Corps officer in large dispensaries are very similar to those exercised in naval hospitals or other large shore facilities. He may be assigned as administrative assistant, personnel and record officer, finance officer, or a combination of all of the above functions. The specific duties are contingent on the type of organization.

Primary functions are to process health records, compile medical reports, procure and supervise the issuing of medical supplies, and maintain accounting records.

THE OFFICE OF THE DISTRICT MEDICAL OFFICER.—A senior Medical Service Corps officer maintains and supervises the administrative functions of this office. He maintains a constant file on the hospital corps personnel assigned within the district. He recommends transfers to adjust staff personnel census of the various medical activities. He maintains an over-all picture of patient load and other pertinent information obtained from medical reports submitted through his office to the Bureau of Medicine and Surgery. He brings to the immediate attention of the district medical officer any

matter requiring his attention. In addition to these duties he assists the district medical officer in the inspection of medical activities within the district.

MEDICAL SERVICE CORPS OFFICERS, NATIONAL NAVAL MEDICAL CENTER

Medical Service Corps officers function in every division of the National Naval Medical Center in administrative capacities common to other large Medical Department facilities.

U. S. NAVAL SCHOOL OF HOSPITAL ADMINISTRATION.—Medical Service Corps officers at this Medical Department facility exercise the functions of command. The senior Medical Service Corps officers function both as commanding officer and executive officer, and make up the staff of this activity. In addition to the administrative responsibilities common to all activities, they act as instructors in general and cost accounting; internal hospital accounting; procurement and accounting of Medical Department property; office management and hospital personnel administration; civil readjustment; safety engineering; legal procedure and naval law; commissary administration; maintenance methods; physical and infantry drill, and in other subjects pertaining to the field of hospital administration.

FUNCTIONS OF MEDICAL SERVICE CORPS OFFICERS ATTACHED TO STAFF OF FLAG OFFICERS

Officers so assigned function as administrative assistants to a fleet, force, or regional inspector.

Specifically, their duties are to:

1. Coordinate the work assigned to the office of the fleet, force, or regional inspector.
2. Inform and make recommendations, as may be indicated, with respect to the effectiveness of the administrative organization and management.
3. Assist the staff medical officer in medical logistics.
4. Control and distribute official mail, and maintain adequate records of incoming and outgoing mail of the staff medical office.
5. Have custody of and be responsible for the security of the files, documents, records, and reports.
6. Aid and assist the staff medical officer in the inspection of all medical activities within his jurisdiction, and in the preparation and submission of required reports under the direction of the staff medical officer.
7. Advise and makes recommendations to the staff medical officer with respect to the adequacy and assignment of military (including civilian where indicated) personnel allowances and complements.
8. Assume responsibility for the preparation, maintenance, custody, and submission of all staff reports and returns pertaining to the medical activities.

FUNCTIONS OF THE MEDICAL SERVICE CORPS ASSIGNED WITH THE INDUSTRIAL MOBILIZATION DIVISION OF THE ARMED SERVICES' MEDICAL PROCUREMENT AGENCIES

A Medical Service Corps officer is attached to each of the offices of the industrial mobilization division of the Armed services medical procurement agencies, located in Brooklyn, N. Y., Chicago, Ill., and Oakland, California. Their function is to study and make surveys of industrial plant facilities, to determine industrial resources, and prepare requests for tentative allocations of materiel.

BATTLESHIPS, CARRIERS AND NAVAL VESSELS OTHER THAN HOSPITAL SHIPS

A Medical Service Corps officer assigned to major fleet units functions as administrative assistant to the medical officer, and he may, at the discretion of the medical officer, be assigned additional duty as medical division officer. His functions as an administrative assistant are to:

1. Coordinate administrative procedures within the medical department of the ship.
2. Keep the medical officer informed, and make recommendations as may be indicated, with respect to the effectiveness of the administrative organization and management.
3. Control and distribute official mail, and maintain adequate records of incoming and outgoing official mail pertaining to the medical department. Have custody of and be responsible for the security of the files of the medical department, documents, records, and reports required to be filed therein.

4. Be accountable to the medical officer for the procurement, issue, and custody of all government property within the medical department of the ship.

5. Be responsible for the preparation, maintenance, and submission of all records, reports, and returns for the medical department of the ship.

6. Assist, if called upon, with the sanitary inspections, lectures, and demonstrations.

DUTIES AS DIVISION OFFICER.

1. Have general management of the hospital corpsmen as to their assignment to duty, liberty, special requests, discipline, uniform, and the preparation of the watch quarters and station bill.

2. Make a daily inspection of the hospital corpsmen berthing spaces and be responsible for order and cleanliness of such spaces.

3. Supervise the program of instruction of hospital corpsmen in their professional duties.

RODENT CONTROL OFFICER

A Medical Service Corps officer and officers of the Hospital Corps are frequently assigned duty in connection with rodent control. When functioning as rodent control officer, he is responsible to the senior medical officer of the activity to which he is assigned.

Specifically his duties are to:

1. Supervise rodent control work on the station or ship to which he is attached or assigned.

2. Instruct and train personnel assigned to do rodent control work in the proper methods of exposing free and poisonous baits, setting traps, rat-proofing structures, and maintaining strict sanitation.

3. Procure the necessary provisions to assure an immediate and readily available supply of bait materials, traps and other items that may be required in control operations.

4. Make periodic inspections of the facilities, installations, and adjacent areas, to assure that rodent control programs are being properly executed, and to determine the effectiveness of control measures.

5. Check, by inspections of ship-shore rat control measures, to insure enforcement of proper safeguards by port director's office.

6. Correlate rodent control operations with other phases of sanitation and maintenance, to facilitate use of trained personnel on related projects.

7. Contact marine, army, municipal, or native village officials and arrange cooperative rodent control projects where required, to control rodents in areas adjacent to naval facilities.

8. Make reports of periodic inspections, and monthly reports of routine activities, to the senior medical officer.

DENTAL FACILITIES

Medical Service Corps and dental clerks (warrant and chief warrant officers of the hospital corps) are assigned to the larger dental activities. These officers' functions are to supervise the record offices and property and accounting offices, instruct enlisted personnel in administrative duties and, in some instances, supervise prosthetic laboratories of the larger dental activities.

In the larger dental activities, these officers also serve as administrative assistants to dental officers in charge, and to dental commanding officers.

SANITATION OFFICER

An important function of the Medical Service Corps officer ashore is that of sanitation officer, who is responsible to the senior medical officer for inspections, recommendations and supervision in all matters of sanitation, including the sanitary aspects of food and food handling, water, sewage and waste disposal, housing, insect and pest control, and other elements of environment affecting health.

The sanitation officer should keep himself informed regarding the latest advances and practices in sanitary science and preventive medicine. Under the medical officer he will undertake those phases of training which pertain to sanitation.

It is his function to cooperate with civilian and other governmental activities having to do with public health problems that may effect naval personnel on or in the vicinity of his activity.

He will make inspections at frequent intervals, will make recommendations for appropri-

ate action, and report to the proper authority with respect to the effectiveness of the recommended or instituted programs.

DEPUTY VENEREAL DISEASE CONTROL OFFICER

If a Medical Service Corps officer is assigned as the deputy venereal disease control officer, he is responsible to the medical officer, through the venereal disease control officer of the district, river command, or station to which assigned.

His functions are to:

1. Assist in the planning and development of a comprehensive venereal disease educational program, including lectures, visual aids, and other mediums.
2. Train personnel in interviewing, contact reporting, and education.
3. Advise and assist in the administration of the contact reporting system by compliance with current directives and evaluation of contact data compiled therefrom.
4. Assist in the preparation of administrative and statistical reports, including the monthly venereal disease control report.
5. Assist in the establishment and maintenance of prophylaxis facilities and programs.
6. Effect a liaison between the district medical officer and other military services and civilian health agencies for prevention and control of venereal diseases, attending meetings of the joint Army and Navy disciplinary control board, when directed.

FUNCTIONS OF THE HOSPITAL CORPS OFFICERS

The warrant and commissioned warrant officers of the Hospital Corps are generally administrative assistants and their functions, with limitations, are similar in character to those of the Medical Service Corps.

Officers of the Hospital Corps must be thoroughly familiar with Medical Department administrative procedures. Hospital Corps officers are accountable for all equipment and stores in their charge, exercising personal supervision over their condition and the economical expenditures thereof, and reporting any deficiency to the responsible authority. When attached to a unit or an activity going into or out of commission, they personally supervise the checking and testing of all equipment in their department. They take such battle station and station for daily quarters as may be assigned by the commanding officer.

Wherever officers of the Medical Service Corps are assigned to duty, warrant or commissioned warrant officers of the hospital corps may function as assistants to such officers.

FUNCTION OF MEDICAL SERVICE CORPS OFFICER IN HOSPITAL CORPS SCHOOL

The systematic training and instruction of enlisted personnel of the Hospital Corps is an important function of the Medical Service Corps.

The Hospital Corps schools are, as a rule, under the command of a medical officer. The Medical Service Corps officer may function as executive officer and in other administrative capacity. He prepares the curriculum and schedule of instruction for the approval of the commanding officer, and also functions as instructor in his special subject.

CHAPTER 24

FUNCTIONS OF MEDICAL SERVICE CORPS OFFICERS

FUNCTIONS OF THE MEDICAL SERVICE CORPS, ALLIED SCIENCES

The rapidly changing nature of modern warfare has emphasized the limitations of human capacity in military operations. This fact was readily recognized by the medical department, and in a farsighted program of expansion initiated in the early days of the war several hundred scientists allied to medicine were enrolled in the Naval Reserve in specialists' classifications. These officers proved themselves invaluable in the field of research and preventive medicine. They functioned at the various fronts and aboard ships, at training centers and research laboratories, and contributed materially in the early days of the Pacific campaign in combating and controlling such diseases as malaria, dengue, filariasis, and dysentery. Physiologists made unmeasurable contributions in aviation by developing new concepts in the field of night vision and dark adaptation. They developed a night lookout technique, special red goggles for dark adaptation of fighter pilots, designed the Navy radium placque adaptometer for screening personnel with poor night vision, and engaged in work involving the many complex problems of selecting and training officers and men for the highly specialized duties of naval warfare.

The need of a corps of scientists to complement the purely professional functions of the Medical and Dental Corps was demonstrated in World War II. A natural sequence was the establishment of the Medical Service Corps, which included specialist personnel in the field of science allied to medicine. Their function is to maintain medical research and developments for application to naval medical problems; to maintain freedom of research and interchange of ideas, concepts and results; and to encourage free dissemination of scientific investigations in their specialty, except those involving national security.

Specifically, the duties of the individual allied science officer are as follows:

1. Originate, initiate, plan, develop, coordinate, perform, or supervise in research, scientific investigations and examinations, practical testing and control measures in the field of medicine and allied sciences.

2. Evaluate the details of proposals, ideas, devices and research findings on subjects related to the health of the Navy, and make recommendations accordingly.

3. Advise and make recommendations as to the professional needs, policies, standards, practices, procedures, investigations or research in all matters that relate to their special field.

4. When so designated, act as liaison in all matters pertaining to their specialty in a science allied to medicine or dentistry, with civilian or other agencies to promote cooperative efforts.

5. Advise and recommend appropriate policies, standards, practices and procedures with regard to measures in the field of preventive medicine, and assist in solving problems in the field.

6. Have immediate supervision of the professional services in a field laboratory or other scientific laboratory or other scientific units.

FUNCTIONS OF THE INDUSTRIAL HYGIENIST

Under general administrative direction of the industrial medical officer (S.M.O.), the industrial hygienist shall, in cooperation with the industrial relations officer (Safety Branch), initiate, plan, supervise and carry on an effective industrial hygiene program as a part of the naval activities' Industrial Health Program in order to decrease absenteeism, maintain high morale of employees, and reduce Government compensation costs for occupational disease.

The industrial hygienist shall serve as consultant on all industrial hygiene matters to the commanding officer, department, branch and section heads, and supervisors; serve as a representative of the CO on committees, in conferences, and other activities involving consideration of various industrial hygiene matters; maintain close liaison and cooperate with heads of all departments to effect a complete integration of the industrial hygiene program with the various other departments of the activity; and make recommendations through the proper authorities for correction of conditions which are found to exist which are operating to lower the vitality of employees and thus destroy efficiency.

CONTROL OF ATMOSPHERIC HYGIENE OF PLANT.

1. In order to carry out these duties the industrial hygienist will have to make periodic and special inspections (reconnaissance surveys) of plant and office facilities for the purpose of detecting and investigating the use of any material or process which has any degree of hazard associated with it, or any material or process where the toxicology or hazard is unknown to the employees or management. Such inspections are necessary so that proper precautions may be taken in advance to obviate any ill effect on employees. Constant inspection is a necessary method of keeping abreast of new developments. Such inspections will oftentimes lead to more detailed surveys. This phase of the work requires an intimate knowledge of all processes carried on in the plant.

2. The industrial hygienist will initiate and plan surveys of potential health hazards encountered in handling of materials to determine quantitatively the degree of hazard of each occupation. This calls for planned investigation of working environment, the collection of samples in the laboratory and in the field, making measurements in the field relative to occupational disease exposures, and the laboratory analysis of samples. Occasionally, the industrial hygienist will be called upon to supervise a survey in the naval activity as part of a nationwide survey sponsored by the Bureau of Medicine and Surgery.

3. The industrial hygienist will have the responsibility of operating an industrial hygiene laboratory. He will administer the laboratory and will be professionally qualified to perform the necessary chemical, microchemical and biological techniques necessary for the successful operation of such a laboratory. This will consist, in many cases, of microchemical techniques for the analysis of samples obtained from environmental studies and clinical specimens attained from periodic employee examinations. The clinical work will involve making decisions as to what biological specimens ought to be collected from various patients depending upon the nature of the individual exposure or the nature of the illness. To make these decisions it is necessary to know the physiological effects and toxicological nature of the materials, and in many instances the manner in which they are broken down within the body. The quantitative and qualitative chemical analysis of inorganic and organic materials in whatever form, such as gases, vapors, dusts, fumes, mists, liquids, or any other material submitted to the industrial hygiene laboratory with reference to the causation of disease. He will direct the laboratory personnel in specific analytical procedures and in the use of various types of equipment for obtaining samples in the field. Included among these would be such equipment as electrostatic precipitator, impinger, light meter, flow meter, manometer, combustible gas indicator, indicators and detectors for oxygen-deficient, toxic and explosive atmospheres, and such other scientific instruments and technical equipment generally used for the determination of occupational disease and health hazards. He shall investigate hazards due to physical conditions, heat, humidity, light, radiations, air pressures, repeated motions, noise, etc., in addition to chemical hazards. Above all, his background and training must be sufficient to enable him to realize the limitations of his various instruments and be able to make adaptations to solve the problems at hand. He shall have the ability to calibrate and maintain instruments used in the field and in the laboratory, and he may be called upon at times to develop procedures and equipment for more efficient laboratory analyses. In addition to the clinical and chemical analyses referred to, the laboratory will be equipped to perform bacteriological

examinations and pasteurization tests on samples of milk and milk products received for use in the station, also bacteriological examination on specimens of water collected at key points.

4. He shall keep records and files of studies and examinations.

5. The industrial hygienist shall be responsible for the establishment and development of plans for safeguarding the health of personnel in all operations involving exposure to radiological hazards. This will include the establishment and development of radiological health plans, the monitoring of equipment, personnel decontamination procedures, and regular inspections of radiological safety arrangements. In addition, he shall act as a technical consultant in the preparation and development of detailed radiological defense plans for the station.

PERIODIC TESTING OF EMPLOEES IN HAZARDOUS OCCUPATIONS.

To test employees in various hazardous occupations periodically; to detect early symptoms of overexposure to noxious substances; to detect instances of existing ill health likely to place such employees or their fellow workers in danger; and to recommend to the medical officer changes in occupation where indicated. Examinations of groups of persons in which the industrial hygienist would participate would be foundrymen, electroplaters, welders, burners, X-ray workers, cranemen, engineers, and employees working with toxic solvents such as benzene, carbon tetrachloride, trichlorethylene, etc. The nature of the work performed determines the type of examination given.

To review all occupation disease cases, and investigate the circumstances surrounding them.

NOTE:—The industrial hygienist's experience and findings will be utilized by the dispensary staff for determination of etiology of occupational injuries and illnesses.

From background experience and tests, the industrial hygienist will draw conclusions on the existing degree of hazard and the adequacy of existing control measures. He will prepare reports of findings and recommend control measures, where required, to the proper authorities.

To compile data for research purposes and to extend knowledge of correlations between symptoms of disease and exposures to industrial conditions.

The industrial hygienist will act as technical consultant in matters pertaining to plant cafeterias and shop sanitation. When so detailed, this will include actual inspection of these facilities. It will be his responsibility to safeguard the station water supply, making recommendations for correction when insanitary conditions are found. He will be prepared to conduct inspections and furnish technical instructions for the discovery and elimination of insects and rodents, which will include the correction of conditions that contribute to their food supply and harborage.

He will direct such health campaigns as personal hygiene, nutrition, etc., and originate requests for dissemination of general information educational material as pertains to industrial hygiene.

He will take part in the work improvement program to inform professional and supervisory lay personnel on matters pertaining to the status of current practices in the prevention of occupational diseases, in order to maintain and improve health standards in the shops and offices, and he may be called upon at times to address employees on the safe handling of toxic materials.

He will advise by recommending approval or disapproval of beneficial industrial hygiene suggestions.

The industrial hygienist will prepare, and deliver if necessary, a course in radiological defense ,in the form of lectures for the enlightenment of civilian and service personnel, on matters pertaining to radiological hazards.

He will act as advisor to the safety engineer on conformity to accepted industrial hygiene standards of plans, specifications, and process hazard controls; and make recommendations for improvement of work environment.

He will review bids, offer opinions, and make requests for stocking by supply department of items pertaining to health and sanitation.

He will assemble and submit special informa-

tion as required by the Bureau of employees' compensation.

FUNCTIONS OF THE ENTOMOLOGY OFFICER

The entomology officer is *responsible for the eradication or control of insects and other vermin, to preserve property and protect the health and morale of personnel.* The number of entomology officers trained in insect and pest control will generally be small; therefore the services of such officers must be used on an area-wide basis to give adequate protection to all naval facilities.

The entomologist conducts research and investigations on insects, mites, ticks, and other disease vectors and an intermediate host of pathogenic organisms which are of vital interest to the military forces. He will be concerned with the classification and identification of dengue-, filarias-, or malaria-bearing mosquitoes, or scrub-typhus-bearing mites.

These officers will be responsible for the following:

1. Education of personnel in individual measures for protection against insect-borne diseases endemic in the area.
2. Instruction and training of personnel assigned to insect and pest control activities in proper methods and precautions.
3. Maintenance of periodic surveys to determine breeding areas and species.
4. Supervision of insecticide dispersal and other methods of insect control.
5. Recommendations relative to construction and maintenance of screens, ditches, surface water drains, fills, and the clearing of streams.
6. Recommendations for the location of camp sites at suitable distances from habitations where insect-borne diseases are endemic.
7. Recommendations for the location of camp sites at suitable distances from habitations where insect-borne diseases are endemic.
8. Inspection of Naval facilities, installations, and adjacent areas, to assure that programs are properly executed and make recommendations for appropriate action.
9. Cooperation with civilian and other governmental activities having problems that may affect naval personnel on or in the vicinity of a station.
10. Report as required with respect to effectiveness of the recommended or instituted program.
11. Assist and advise on any phase of control required, keeping informed of latest methods.
12. Provide for procurement, storage, and issuance of supplies and equipment, including proper safeguards for handling of poisonous materials.

FUNCTIONS OF THE PATHOLOGIST

The function of the pathologist is to study the causes, nature, and development of disease, and the abnormal functioning of the diseased body. The pathologist should be especially concerned with the functional and structural changes in blood, nerves, organs, and tissue caused by diseases.

In the field of clinical pathology it is the function of the pathologist to decide what tests are necessary in a particular case. He may make them himself, or direct and supervise technicians in doing so. These tests include bacterial examinations; chemical tests; serum, spinal fluid, and lymph tests for parasitic infection; and the gross and microscopic examination of tissue. The pathologist interprets the results of tests, determines the nature and extent of the diseased conditions, and reports his findings to cognizant authority.

In naval hospitals the pathologist assists in autopsies when so directed by the commanding officer or, in his absence, the executive officer. He is responsible for the preparation and preservation of pathological material that may be required as court evidence in medical legal procedure.

The pathologist is responsible for the efficient operation of the pathology service and for organizing a research program, either clinical, (diagnosis and treatment of disease in patient) or experimental, (as in the production of artificially-produced disease in animals).

Other important functions of the pathologist are availability as witness in court procedure, and teaching in medical or dental schools.

FUNCTIONS OF THE PHYSIOLOGIST

Fundamentally the function of the physiologist is deeply rooted in the field of research. This is particularly true of the Navy phys-

iologist, whose concern is with the vital functions of the body under the abnormal conditions experienced in aviation, submarine-and deep-sea diving.

The function of the physiologist is to develop new projects and experiments in the biological sciences, including physiology, biochemistry, morphology, endocrinology, and microbiology. Training and background in experimental fields must be broad and varied, to insure comprehension of problems and a practical technical approach. He must keep clear, concise, comprehensive, and objective records; and, of equal importance, must be able to translate these records into well-written reports. The physiologist has a professional obligation to submit for publication with the approval of his immediate superior, full and clear statements of any findings which appear to be of general interest, and which are not detrimental to the national security.

Success in the field of physiology is predicated on many factors. One of the most important is the physiologist's ability to search the literature in relevant fields, and to keep abreast with trends therein. Contacts should be maintained with specialists in research institutions and civilian industrial enterprises, and fullest cooperation extended when feasible.

When functioning as senior physiologist at the National Naval Medical Center, Bethesda, Maryland, he may be assigned the responsibility for developing a program of instruction in physiology, and its revelant fields, for postgraduate classes at the Naval Medical and Dental Schools, component commands of the National Naval Medical Center.

FUNCTIONS OF THE CHEMIST

The high degree of specialization in the field of chemistry, and the variegated naval activities (related to medicine) requiring the functions of the chemist, make it impractical to outline each and every function in detail.

Major functions of the Navy chemist are to participate in and coordinate research and development programs. Analysis, testing, and process control are other duties. He must be available for consultations on matter related to the field of chemistry; standardize drugs and chemicals; standardize, and test for activity, various biological products; apply chemistry to sanitation problems; and carry out investigations in the field of radiological contamination and decontamination.

Conceivably a Navy chemist may be assigned duty in connection with development of chemical warfare agents, such as gases, smoke, incendiaries, and other agents. He may be required to do research in defensive chemical warfare involving development of gas masks which will afford protection against all chemical warfare gases. Such masks should have a low breathing resistance, relatively long-service life, be an efficient filter for particular clouds, and must not deteriorate in storage. An important function of the Navy chemist is to study and devise methods of treating clothing with special chemicals and films which resist the penetration of gases. Special study should be given to the development of portable devices for the rapid detection and identification of gases, and to techniques for the decontamination of clothing, ships, buildings, and grounds.

A primary function of the Navy chemist is to develop and maintain new projects in the field of human engineering, bearing in mind the many problems involved therein. Such projects should point to measures for prevention of carbon monoxide poisoning, anoxia, and other toxic agents.

The naval chemist should maintain close contact with civilian research institutions and industrial projects, and keep informed on new developments in his special field.

FUNCTIONS OF THE PHYSICIST

The physicist's functions in the naval service are predominantly in the field of electronics as applicable to medical research. His function is to plan, organize, and coordinate projects leading to the development of new instruments, devices, methods, and technique in medical research problems.

Originality in thinking is a required function of the physicist. Problems are frequently presented in bare outline form, expressing merely the desired results, and the physicist is expected to develop a solution. It is his function to initiate the necessary research procedure to bring the experiment to a conclusion satisfactory to the medical research group which

presented the problem. His success is predicated on his ability to think along original lines and to create, develop, visualize, and suggest new and helpful applications of electronics, to aid the work of the medical investigators.

An important function of the physicist is to collaborate with other naval and civilian agencies employing chemists, physiologists, physicians, pathologists, dentists, bacteriologists, and other scientific personnel.

A physicist specializing in electronics may be required to organize and assume charge of an electronic section for a field operation. When so functioning he may be required to install and operate automatic electric cameras in a given operation.

The problems relating to sound reproduction, transmission, and absorption, as involved in a variety of communication, recording, and reproducing systems, are in the field of the physicist. The study of underwater sound transmission and sound detection, especially as applied to submarine warfare, is a very important function of the physicist. He is also concerned with development, transmission, conservation, and measurement of heat ashore and afloat.

The use of radioactive isotopes in physiological research is becoming increasingly more important in every kind of physiological and pharmacological research. Therefore, it is the function of the physicist to initiate projects to study these and other radioactive elements applicable to medical research.

FUNCTIONS OF THE BACTERIOLOGIST

The functions of the bacteriologist are to advise on, administer, supervise, or perform research or other professional and scientific work in the study and investigation of bacteria, Rickettsiae, viruses, and other such micro-organisms, including their origin, form, structure, and life processes; their importance in the causation of human, animal, or fish diseases; methods of sterilization, disinfection, and control; their use in the treatment of diseases; and their role as problems or agents in sanitation, decomposition, fermentation, and industrial processes.

It is the bacteriologists' function to investigate the activities of bacteria in the manufacture, spoilage, and deterioration of food products; to isolate, culture, and identify the micro-organisms causing deterioration or decomposition of food; and to study and determine means and methods of inhibiting the activities of such objectionable micro-organisms. Bacteriologists investigate the viability and activities of bacteria in foodstuffs that are canned, frozen, or pickled, and determine the conditions or factors influencing the activities of micro-organisms in canned, frozen, pickled, or preserved foods. They determine how and in what ways foodstuffs may become contaminated, and investigate the feasibility, efficacy, and nature of controls to prevent contamination by objectionable bacteria, including the use of acids and other chemical preservatives.

Other important functions of the bacteriologist are to investigate the biology, distribution, abundance, mode of transmission, and degree of virulence of bacteria, viruses, and Rickettsiae causing disease in human beings; they investigate the nature and efficicacy of chemotherapeutic treatments and of antibacterial (or antivirus) and antitoxic sera, vaccines, disinfectants, and antibiotics in the prevention, treatment, or cure of disease in humans. It is the bacteriologists' function to investigate, prepare, and test diagnostic antigens and vaccines, and to conduct experiments with animals. The bacteriologists must keep in mind that their investigations and results will be applied especially in human medicine and toward the control of infectious diseases in man.

When functioning as head of the bacteriology service in a naval hospital the bacteriologist frequently is required to conduct classes and training programs for the Hospital Corps personnel.

FUNCTIONS OF THE PSYCHOLOGIST

The over-all functions of the psychologist, for the purpose of this discussion, will be divided into two general categories: the functions of the *clinical psychologist* at naval hospitals, training centers, disciplinary barracks, and other activities and the functions of the *aviation psychologist:*

The senior psychologist in a naval hospital functions as the chief clinical psychologist under the general supervision of the commanding

officer, and also as the chief of neuropsychiatry, and directs all clinical and research psychological activities in the psychiatric treatment and training center. He has full professional independence with regard to technical matters in training and research as they apply to the field of clinical psychology; he directs and occasionally participates personally in the selection of appropriate psychological procedures utilized in the diagnosis and treatment of neuropsychiatric service, in unusual cases presenting unique problems or diagnosis and/or therapy. Such activity requires a great deal of ingenuity in development of nonstandardized and unique approaches to particularly difficult problems.

This psychologist also directs the psychotherapy of patients assigned to the clinical psychology department, maintains cognizance of the psychological activities of other departments and services in the hospital, and advises the commanding officer relative to professional and policy matters in regard to these departments. He stimulates, promotes, organizes, coordinates, integrates, and participates in the psychology research program of the Medical Department, U. S. Navy, and relates this program to the research program at the neuropsychiatric treatment and training center.

His program includes evaluation of the effectiveness of therapy, studies of specific groups of patients, construction and validation of diagnostic and prognostic devices, analytic and descriptive surveys, and follow-up studies and surveys. (These project areas are of great significance to Navy medicine and also have immediate application to the treatment of psychotics in the Navy.) He reports advances made in clinical psychological research, through articles or professional publications in seminars and by other media, to inform other agencies, bureaus, and professional circles on a national scale.

Directs the development of and establishes formal courses of instruction in clinical psychology at the university level for medical officers who are residents in training in psychiatry, following the general policies relative to content objectives of the American boards of psychiatry and neurology. He must be able to create, organize, and prepare in detail the courses comprising these curricula according to the most effective educational methods. He participates in the instruction of these residents by conducting courses through lecturing, leading discussions, integrating, and disseminating knowledge gained, pointing out the value of this knowledge, and the professional aspects of clinical psychology and neuropsychiatry.

The psychologist conducts seminars for medical officers who are preparing for American board examinations in neuropsychiatry. He directs and supervises his subordinates in the organization of courses and curricula for neuropsychiatric nurses, hospital corpsmen, and psychological aides. He reviews the completed curricula and supervises the actual instruction being conducted by his staff with these medical personnel.

He maintains cognizance of the activities of all clinical psychologists in the neuropsychiatric treatment and training center, including those who are detailed there for training and instruction prior to their independent assignment to other naval hospital programs; advises the commanding officer regarding the areas of competence of clinical psychological personnel in such a way as to insure placement of individual clinical psychologists in positions where their particular skills and backgrounds can be used to optimum advantage. He also interviews and makes judgments concerning the professional and personality qualifications of applicants for position in the clinical psychology program at the treatment and training centers, and reports, via commanding officer, similar judgments to the head, neuropsychiatry branch, Bureau of Medicine and Surgery, relative to clinical psychologists under indoctrination training at U. S. naval hospital, prior to transfer to other naval neuropsychiatric services.

The functions of the psychologist at naval disciplinary barracks include: providing qualified professional services to the commanding officer of the naval disciplinary barracks and his staff, in the psychological evaluation and treatment of naval prisoners, to further implement the training and treatment programs contemplated by the rehabilitative mission of the activity. The chief psychologist functions as a member of the medical division of the com-

mand, under the immediate supervision of the senior medical officer and the administrative control of the commanding officer. He works closely with the psychiatrist in establishing and providing basic data on mental levels and personality evaluation, and in assisting in treatment therapy. He works closely with the education and training officer in establishing educational levels, aptitudes, and other data essential to placement of the individual in the correctional program. He maintains a close advisory and working relationship with other key officers of the command, including the screening and classification officer, Red Cross officials and Chaplain.

The functions of the aviation psychologist vary with the individual assignment. Broadly speaking his functions are in the field of research and teaching.

Specifically, the functions of the aviation psychologist are to:

Conduct basic research in test theory, learning and training as related to naval aviation; basic research on human relations, social organization and other determinants of effective leadership in the naval aviation organization; make occupational analyses of naval aviation jobs; develop job classifications in terms of what the jobs require of personnel; measure aptitudes, skills, interests, personality variables, and general adjustments; and determines relationships of these factors to success in specific naval aviation assignments.

Other duties of the aviation psychologist are to: conduct studies leading to evaluation of efficiency of personnel selection, adjustment, and training procedures in relation to combat efficiency; develop and test of methodologies for evaluation performance in training and in the fleet; continuously maintain evaluation studies on instruction methods and content of training courses in terms of their relevancy to fleet needs; develop selection procedures and instruments and evaluate such instruments as predictors of leadership success; develop methods of evaluation personnel with regard to leadership qualities; assist aviation cadet selection boards (and/or the medical components thereof) in examining, testing and assigning applicants; initiate and/or maintain courses of instruction in the application of psychological principles for personnel to whom the psychological aspects of their assignments is a secondary tool.

When so directed, he may be assigned to assist the medical officer in the clinic in the field of psychophysiology, to do basic research in sensory and psychomotor functions, psychophysical procedures, vision, and audition; conduct applied research on human factors in engineering design of aviation equipment; conduct evaluation studies on work methods and the determination of optimal procedures needed for efficient integration of man to specialized machines; and to develop selection standards and training procedures for psychophysiological tasks.

FUNCTIONS OF THE NUTRITIONIST

It is the function of the nutritionist to make use of the principles of chemistry and physiology in dealing with the food needs of man and his useful animals, and of the mechanism by which the body uses foodstuffs to build, protect, and repair tissue and to provide energy. The nutritionist should study the physiological needs for each of the different food constituents, the effect of insufficient quantities of these, and the determination of the quantities necessary for optimum health for individuals in different age, sex, environmental, and activity groups.

The nutritionist's primary functions are in the field of research. He should make a study of physical and chemical processes of the breaking down of foodstuffs into substances suitable for use in the body, and the processes of anabolism and catabolism within body tissues and fluids.

He should make food energy studies to determine the production of energy through the oxidation of foods in the body, to enable it to perform both its internal and external muscular work, and the study of the body's energy expenditures for various purposes—growth, activity.

It is the function of the nutritionist to study protein and amino acids to determine the needs for people in different periods of life and under various conditions, such as during pregnancy or recovery from illness; to study the exact measurement of the protein content of foods

and the biological value and amino acid content of proteins, as well as the physiological functions and interchangeability of the amino acids.

He should also make investigations of the functions of each mineral element, their concentration and physiological availability in various foods, and the levels of intake of the different minerals most desirable for optimum functioning of the body during different phases of the life cycle.

The study of vitamin content of foods is an important function of the nutritionist. He should carry out investigations of the vitamin content of foods and the effect of various factors—growing conditions, variety of crop plant, or processing—on the vitamin values of plant or animal foods; also, investigations on the quantitative needs for each of the vitamins, their specific functions in the body and the optimal levels for individuals according to age, sex and activity.

It is the nutritionist's responsibility to make appraisal of the nutritional condition of individuals and the factors affecting them, and make comprehensive reports on his findings to the proper authority from time to time.

FUNCTIONS OF THE PARASITOLOGIST

Animal parasites of economic or medical importance cause disease in man, livestock, poultry, and other organisms, including protozoans, helminths and certain arthropods.

The functions of the parasitologist are to advise on, administer, supervise, or perform research or other professional and scientific work in the study, investigation, and control of animal parasites of man, domestic animals, poultry, and aquatic organisms, including fish.

The parasitologist is responsible for formulating, directing, and coordinating a highly specialized and important research program in the investigation of the major or serious parasitic diseases of man. Such program should be executed through central and field laboratories in cooperation with other agencies.

Such program responsibility involves and includes investigations of the course, diagnosis, modes of transmission, and methods of prevention, treatment, and control of the major or serious parasitic diseases of human beings through laboratory and field investigations and the development and improvement of measures employed in the control and eradication of these diseases.

It is a function of the parasitologist to plan and direct studies of diseases as they may occur in the naval service or anywhere in the United States or foreign countries under circumstances which make it important that their identity be established in order to safeguard public health and to prevent death or illness through epidemics or the introduction and spread of new diseases. Additional functions are the preparation and testing of antigens and diagnostic agents and the examination of samples of biologics.

Parasitologists should frequently consult with and advise civilian authorities in related fields to develop and interpret information, exchange ideas, advise regarding problems and methods in parasitology, and interpret their own or other's findings. They are responsible for all correspondence related to their office and prepare papers of a technical nature concerning the various aspects of their work. They frequently function as consultants and attend and address medical or scientific meetings.

FUNCTIONS OF THE VIROLOGIST

The functions of the Navy virologist fall into two categories, namely routine and research.

Routine duties are concerned with the supervision and maintenance of many strains of viruses and Rickettaias in serial egg and animal passages in order to provide stocks of infectious materials for experimental work in virology or other investigations. This involves the production of quantities of infectious material of various strains requiring highest skill and tedious technique.

While the routine animal passage and the care of the animals may be carried out by technicians it is essential that the virologist closely observe and supervise the passages. This is necessary by reason of the fact the viral and Rickettaial strains are subject to spontaneous mutation and varying trophisms. Close supervision by the virologist is necessary to reduce the incident of infection of these disease pro-

ducing agents. Experience has shown that the greatest danger of accidental infection results from the maintenance of disease-producing agents in the embryonated hen's egg. Therefore it is the virologist functions to personally, perform all of the inoculating and harvesting procedures himself to avoid exposing laboratory technicians and fellow workers.

Functions in research are directed toward those factors which make for increased concentration of viruses and Rickettaias obtainable from the embroyonated egg. Preparation of purified suspension of *R orientalis* from yolk-sac culture of the organism, and their uses as experimental vaccines and serological antigens is another research function.

Inasmuch as the character of the virologist's work is intensified considerably by the fact that his problems ramify into the fields of chemistry, physics, physiology, entomology, and almost every biological science it is important that the virologist maintain close contact with the specialists in these fields.

The virologist is often required to teach virology and allied subjects to other Medical Department personnel.

FUNCTIONS OF THE MEDICAL STATISTICIAN OFFICER

The function of the medical statistician officer is to carry out the Navy statistical program and to provide information, in terms of data, charts, summaries, estimations, published articles, etc., regarding medical facts pertaining to naval personnel. These take the form of a continuing collection of detailed morbidity data as well as making analyses and interpretations of this material. It is necessary to critically review the reporting system and to administer it in such a way as to obtain the necessary facts in an efficient and expeditious manner. It is also frequently necessary to design new forms or to revise existing forms. Changes and revisions in diagnostic classification, changing needs, new procedures, etc., result in constant checks and evaluations of all morbid reporting forms. In the execution of statistical studies the validity of the data, the analytical methods used, the interpretations, the general conclusions reached, and the appropriateness of the information from a policy standpoint is verified and reviewed. Responsibility for presentation of data in final form, including tables, charts, and written interpretations is one of the primary functions of medical statistician officer.

In the Navy, medical statistician officers may be attached to research units, epidemiological units or with the Medical Statistics Division, Bureau of Medicine and Surgery. While the specific duties would vary with the type of assignment, the work would be interrelated and all pointed to the same end. Naturally the statistician working with an epidemiological unit would be functioning as part of a team and his work would generally be correlated with the assignments of the unit as a whole. Seasonal and cyclical variations, epidemics of respirator diseases, sudden outbreaks of gastrointestinal disturbances, objective evaluating of preventive measures, etc., would be the material receiving the attention of the statistician with an epidemiological assignment.

Medical research statistics is related to research projects undertaken on a wide variety of medical and biological problems. Very detailed and exacting statistical techniques are used in this type of work and much consideration is given to setting up the problem establishing the limitations, definitions, procedures, etc. Not only is it necessary to be able to utilize recognized statistical measures but in most cases the work must be performed simultaneously and in cooperation with the individual in charge of the research project.

The Medical Statistics Division in the Bureau is a coordinating agency in the Navy medical statistics program as well as being the focal point for the collecting, processing, tabulating, analyzing, and interpreting of statistics relating to morbid conditions. The duties and responsibilities of medical statisticians assigned here may be summarized in the following general statements:

1. Review and direct an efficient vital statistics reporting system.

2. Administer an efficient processing system to tabulate all of the detailed material available from the incoming reports.

3. Analyze, interpret and publish data derived from reports eminating from the field.

4. Act as consultants to other divisions, field

activities and research units in setting up experimental designs, definitions, procedures, etc., relating to research problems in the medical field.

5. Make special studies of medical data relating to specific diagnoses of major importance to naval personnel. From such studies make suggestions and conclusions concerning geographical location, incidence, noneffectives, sick days, etc., that will be the basis of determining policy and making administrative decisions.

6. Make estimates of many medical and hospitalization variables such as expected patient loads, seasonal incidence variations, lengths of stay, recruit incidence and many other conditions.

FUNCTIONS OF THE PHARMACY OFFICERS

The practice of pharmacy in the Navy is both like and unlike the practice of pharmacy in civilian life and in civilian hospitals. The purely professional services of pharmacy in the Navy follow established standards and practices of professional pharmacy. However, the total duty of a pharmacy officer in the Navy involves broader functions and additional services in fields related to pharmacy. As is the case with all naval officers pharmacy officers may have certain military duties which obviously are never a part of the functions of a pharmacist in civil life. For these reasons Navy pharmacy officers must possess the broadest possible professional and scientific training and have the imagination and creative ability to organize and operate pharmaceutical services to meet the special requirements of the Medical Department of the Navy.

It is presumed that all pharmacy officers of the Medical Service Corps, both Regular Navy and Reserve, are professionally qualified to direct all types of pharmaceutical service. Under normal conditions pharmacy officers in the junior grades are assigned responsibility for the professional services of the pharmacy in a Naval Hospital, large Dispensary or Hospital Ship. In these posts the pharmacy officer must develop procedures to fit the special facilities and services of the activity. The pharmacy officer should be thoroughly experienced in all phases of routine manufacturing and dispensing operations. His technical training however should have prepared him for services beyond static practices. For example, he should be competent by basic training and experience, to develop, through research, new and improved forms of medication to meet the varied needs of the medical staff; to devise working technics for preparing adjusted pH and buffered ophthalmic solutions; to manufacture sterile solutions as indicated by the needs and desires of the activity, and in general, to keep a step in advance of trends in order to promptly meet any requirements of the medical staff. He must mesh the pharmacy services into the working plan of the activity as a whole and, in particular, supply drugs and other medicinals at the time and in the form required by all of the medical, surgical and dental services. This phase of his work requires a sound working knowledge of the organization and functions of the hospital, dispensary or shop as a unit.

Under the direction of the commanding officer and the concerned medical officers, the pharmacy officer should make periodic inspections of all ward and treatment room drug stocks. He should insure that unused prescriptions and special medication are promptly removed from ward medicine cabinets. He should check the adequacy, legibility and accuracy of all drug labels; removing for relabeling in the pharmacy any unsatisfactory items. Specific rules and regulations govern all dispositions of narcotics, poisons, alcoholics, and dangerous drugs. The pharmacy officer is held accountable for strict compliance with these controls. He must establish working rules for complete labeling of all drugs dispensed; necessary preservative measures and in general, make certain that every possible safeguard surrounds medical supplies issued from the pharmacy.

The pharmacy officer should determine the desires of the commanding officer with respect to the development of a station drug formulary. With the endorsement of the commanding officer, the pharmacy officer should prepare and submit a formulary for the guidance and convenience of all staff members.

All enlisted personnel of the Medical Department are required to receive in-service training. Hospital Corpsmen assigned to duty in pharmacy receive formal training by the phar-

macy officer. This training should be carefully organized to embrace the total subject matter of pharmacy at the technicians level. In addition to planning these courses to provide for proper technical coverage, the pharmacy officer should be conscious of the routine transfer of personnel which may be expected at periodic intervals. Accordingly, the course should be developed in terminal parts so that men under training can expect to complete full sections of the subject matter during a normal tour of duty. Such courses include manufacturing and dispensing pharmacy, pharmaceutical mathematics, pharmacology, elements of inorganic and organic chemistry, first aid, and training in the maintenance and use of technical equipment.

It is the responsibility of the pharmacy officer to maintain an adequate inventory of drug stocks and to transmit formal requests for supplies well in advance of actual need. This necessitates the maintenance of adequate stock control measures and usage rates for all drugs.

It is the responsibility of the pharmacy officer to maintain an adequate pharmacy reference library. Libraries cannot be considered adequate when composed entirely of text books. To keep abreast of the rapid development of medical science, current literature in the form of pharmaceutical journals and manufacturers house organs must be acquired and reviewed. Every pharmacy should maintain a file of newer therapeutic agents. Such a reference file will be found useful to medical officers and also to the supply officer when emergency procurements must be made. A useful therapeutic file can only be maintained through "clippings" and abstracts of current literature. Reports in the literature of research developments and announcements of new drugs should be included in the instruction of all hospital corpsmen on duty in the pharmacy.

Pharmacy officers assigned in the Medical Department supply system may have duty in Navy testing laboratories where all medical supplies are assayed and evaluated. These laboratories also develop new items and check drug and chemical specifications. In such duty pharmacy officers will draw directly upon their technical and scientific background in pharmacy and in qualitative, quantitative and pharmaceutical chemistry. Based upon their general education, Navy and civilian training and experience, pharmacy officers are considered qualified for other assignments in the supply system, including drug procurement, standards, storage, distribution, utilization, tables of supply and general administrative responsibilities. Duties of this type require a broad knowledge of the professional fields of pharmacology, chemistry and pharmaceutical manufacturing and also an understanding of naval operations and Medical Department requirements.

With time in service and advancement to senior ranks pharmacy officers may anticipate assignment to general administrative duties with a corresponding diminution of purely professional duty. Pharmacy officers with appropriate rank and naval experience may be assigned to general duty in the Bureau of Medicine and Surgery, the National Naval Medical Center, the Naval Medical Research Institute, various Medical Department schools and to specialized duties throughout the Naval Establishment.

FUNCTIONS OF THE OPTOMETRIST

The functions of the optometrist, under the medical officer, are to conduct external examination of the eyes and their appendages; determine visual acuity, oculomotor, or oculorefractive errors or defects, and prescribe, fit appropriate lenses therefor, and render such other attention or treatment as may be delegated to him.

It is the optometrist's function to keep the medical officer fully informed as to the condition of patients attended by him and bring to the attention of the medical officer all patients in whom he may discover or suspect pathological or abnormal conditions or who may require medical or surgical treatment.

The optometrist should make appropriate entries, relative to optometric examinations and treatments, in the clinical and health records of patients, signing their name and rank to such entries. Optometrists sign their own prescriptions for corrective lenses and orthoptic training.

Section IV

FUNCTIONS OF NURSE CORPS OFFICERS

INTRODUCTION.—The accomplishments of the Nurse Corps have earned it a prominent place in naval history. The exacting standards of duty, professional competence, and splendid character found among the nurses of the Navy is quite in keeping with the best traditions of the Medical Department and the nursing profession. Wherever and whenever they are needed, nurses are always ready to administer curative measures and care for the Navy's sick and wounded.

Nursing in the Navy is a part of the practice of nursing in general, and though modified by the circumstances of service under which it is performed, the fundamentals are the same. High standards of performance are recognized by the same rewards of promotion and increased responsibilities in the naval service as in any other field of practice. This chapter, therefore, will not deal with the basic principles of good nursing, but with those circumstances under which it is performed in the Navy.

CHAPTER 25

FUNCTIONS OF NURSE CORPS OFFICERS

Nurse's reponsibilities.—In the Navy the responsibilities of the nurse are threefold; they care for the patient, they teach him health rules, and they instruct Hospital Corps personnel in fundamentals of nursing care. This involves working with the hospitalmen in giving bedside nursing care, demonstrating nursing procedures of increasing complexity, and supervising hospitalmen in these procedures.

The nurse in the Navy must ever bear in mind that men in the Hospital Corps are to be prepared for that day when they are called on to care for critically injured men as they accompany them in landing barges to make beachhead assaults against strongly defended enemy positions. A fighting man's chances of life or death will often be determined by the skill with which the nurse has trained her ward corpsmen. Nurses who were in the Navy prior to World War II had this brought home to them forcefully by the performance "beyond the call of duty" of the corpsmen whom they had trained in the days of uneasy peace between the two wars.

The Navy of the present day has women members of the Hospital Corps and, while the circumstances for which they are being trained are different from those which may confront the men, the nurse's responsibility for their training is no less. These women will be assigned to hospital wards and other activities and must be trained to care for critically ill men, women, and children.

Experienced nurses have found it useful to make a list of all nursing techniques and experiences which the ward they are supervising can provide as experience for the Hospital Corps personnel assigned to staff it. A check-off list should be kept, as is done with student nurses, and the "detail" (work assignment sheet) of the Hospital Corps staff arranged to cover each of these experiences. The nurse should indicate when each hospitalman has passed her rigid test for competence in each of these. Using this as a guiding principle, it will be apparent that in order to achieve a balanced experience the work on the ward will need to be divided into units, or "details" as they are termed in the Navy. The corpsmen should be rotated through each detail, with the exception of that of the senior corpsman as this is usually given to the highest rated man or woman of the ward enlisted staff.

The *senior corpsman* is *generally* the nurse's first assistant, for in most hospitals only one nurse will be assigned to a ward, the exception being those wards which care for women patients. The senior corpsman, therefore, should be the most experienced and competent member of the enlisted staff. Since the senior corpsman does not work 24 hours a day, another man must understudy him and be able to perform senior functions in the absence of the regular senior corpsman.

The senior man should be taught to make out all ward administrative reports and all chart and treatment forms; he should be made familiar with the sources of supply and the methods of procurement of supplies. He should be taught to administer medications and treatments, and to handle the ward during those hours when one nurse may be responsible for more than one ward, as on afternoon duty. A properly trained senior corpsman should be able to assist in all of the housekeeping and routine administration of the ward and in the management of other ward personnel. The ward nurse will accomplish much more if she allows the senior corpsman to assume and carry out those responsibilities for which he has proven himself competent. If he is not able to do this, then he requires further training and that training is the responsibility of the ward nurse.

In addition to the check-off list for skill in nursing procedures and techniques, demonstra-

tions and return demonstrations, the nurse should find some time, perhaps 15 or 20 minutes in the day, to devote to formal teaching of all hospitalmen. This period can be the occasion for a case study or a discussion of new medications or techniques. Such instruction will yield returns far beyond the time expended upon it. Charting procedures and instruction in the fundamentals of charting may be the subject for some of these periods, for all corpsmen should be taught to keep a good chart and to fill in the routine information on requests for laboratory work or special examinations ordered by the medical officer for patients on the ward.

A few minutes of the instruction time should be reserved for answering questions from corpsmen, and in the daily work of the ward the questions brought out in the class periods may be illustrated. Remember always that you are preparing the corpsman for the time when he will not have you at hand to direct and advise him. It is your responsibility to make him a competent and trustworthy member of the health, nursing, and first-aid teams.

Supervision and teaching on the level required in the Navy demands more than average professional maturity and responsibility on the part of the nurse. It presupposes a complete understanding of the work to be done; a comprehension of the capacity of each of the workers assigned to her; an attitude of helpfulness and recognition of the fact that she is teacher as well as ward manager; the ability to plan and direct the work of other personnel. This planned work, the various "details" of which make up the management of her ward, should be *written* and posted as a reference for all. Work details should be modified and changed as the need arises. In addition to having the detail in writing, it should be carefully explained to each individual concerned. Then, when there is neglect or careless performance of any detail, the individual responsible can be singled out and such corrective measures as are necessary applied.

The *actual bedside care* of the patient is the professional responsibility of the ward nurse, though some nursing duties may be delegated to personnel who have demonstrated competence to perform them. For instance, if the ward nurse has no corpsman competent to administer medications, she must attend to this duty herself until she can train a competent man to handle it. She is responsible for carrying out all nursing functions. As a means of facilitating this work, the *Ward Order Book* is maintained by the nurse in charge of the ward. This is similar in organization and content to that kept in civilian hospitals with which the reserve nurse is more familiar.

The nurse is at all times responsible for keeping a close check on her patients. She must know when change in a patient's condition should be called to the doctor's attention—and how to get him quickly. At the same time she must be competent to meet medical and surgical emergencies in the absence of an officer or until he can get there. When emergency occurs the ward officer should be summoned. If he is in the operating room or unable to come for some other reason, the emergency call should be sent to the officer-of-the-day. He will come or send another officer of the Medical Corps.

By familiarizing herself with methods preferred by the doctors with whom she works, the nurse can give quick and efficient assistance on emergency cases where time is often a vital factor.

In the Navy the nurse will care for three types of patients: service personnel of the Navy and Marine Corps, dependents of service personnel, and Veterans' Administration patients. The first group, the *active service and retired personnel of the Navy and Marine Corps,* is the primary responsibility of the Medical Department. Medical care is given to them in hospitals, dispensaries, hospital ships, or in sick bay (small hospital section) aboard ship. In the wards where these men are cared for, often only one nurse may be assigned. She is assisted by corpsmen, the number varying according to circumstances.

This group includes the service women in the various branches—the Navy nurses, Waves, Spars, and Marines. Most hospitals have women's wards, and when the census includes a number of acutely ill or bed patients, a nursing staff is assigned to meet these needs. Sometimes one nurse is assigned, supplemented by Wave hospitalmen; at other times the staff consists

of one or more nurses and a quota of enlisted men of the Hospital Corps.

The second group of patients cared for in naval hospitals is made up of *dependents* of service personnel. These patients are comprised mainly of women and children in wards devoted to obstetrics, pediatrics, and gynecology. The nursing staff of these departments is usually composed of nurses and Waves. More than one nurse is assigned to a watch in these wards. particularly in those devoted to obstetrics where the delivery and labor rooms and the nursery each require a nurse.

The third group of patients cared for in naval hospitals is composed of Veterans' Administration patients. Veteran facilities are not always adequate in number to care for all of their patients and some are geographically located so far from the home of the patient to be cared for as to work a real hardship on the family. In these cases, the Veterans' Administration arranges for the care of the patient at the nearest government hospital facility. Many of these patients are the middle-aged or older groups and require expert nursing care. Some are chronic in their illness, but many are the circulatory, metabolic, gastro-intestinal, and upper respiratory diseases which characterize this age group. Others require major surgery and orthopedic treatment of an extensive nature.

WARD REPORTS

Combined with the professional responsibilities of nurses in the Navy are certain administrative duties, one of the most important of which is the maintenance of complete and accurate ward reports. This is the individual responsibility of the nurse in charge of the ward, though some of these record-keeping duties may be delegated to the senior or other corpsmen on the ward as a part of their training program. (Eventually the corpsman may be part of the sick bay staff aboard a combat ship and will be expected to know how to keep these records.) The responsibility for their performance lies with the nurse.

Following is a description of the various types of ward reports used at naval hospitals. All forms illustrated are in use, at this writing, in the Naval Medical Center, Bethesda, Maryland. Although there may be some local variations, the general principles apply to forms used in other hospitals.

LOG.—This is Navy parlance for the Ward Order and Report Book. It is to be kept by the nurse in charge for the total 24-hour period of each day. This log may not be delegated except during the evening and night hours when one nurse may be responsible for several wards. Then the corpsman on watch may make the entries. The night corpsman's report is written in red and is continuous with the log kept by the nurse in charge during the day. The log must be signed by every nurse who assumes the duty to indicate that she has read and is familiar with the orders contained therein. The night nurse reads and countersigns the night corpsman's portion of the log, adding any additional reports which she considers pertinent.

DOCTOR'S ORDER BOOK.—This book is to be kept available, in the same place, at all times and must be checked at frequent intervals to be sure that all orders have been carried out. This is particularly true during the evening and night hours when one nurse may be responsible for more than one ward and the doctor may visit patients without the nurse's knowledge.

TEMPERATURE, PULSE AND RESPIRATION BOOK. —This is to be kept up-to-date at all times, with the patients listed according to bed order. It is checked before each temperature, pulse, and respiration time. The schedule for a routine temperature, pulse, and respiration check is usually 10 a.m. and 2 and 6 p.m., though patients with elevations or conditions requiring more frequent readings may be put on a schedule as indicated. The measures should be taken with or without an order by the doctor. It is a fundamental of good nursing in the Navy, as elsewhere, that the patient who has an elevation of temperature, a chill, or who develops any condition in which temperature is significant, is to be automatically checked as often as indicated. This applies also to pulse and respiration, individually or in combination with the temperature recording.

Ward roster.—This record lists all patients on the census according to bed number, so that new personnel assigned to the ward may find individual patients without delay. It is used

N. M. S. H.-Form 9
(1939)

WARD REPORT

Ward 3 D. (Name or number) _____ (Date)

Beds actually occupied 35 Unoccupied 3

Patients remaining from last report	33
Admitted to hospital	2
Admitted from other wards	1
Total admitted	3
Discharged from hospital	1
Discharged to other wards	0
Total discharged	1
Remaining	35

CHANGES IN WARD SINCE LAST REPORT.

INSTRUCTIONS.—Enter admitted cases first, then draw a line across the sheet and enter those disposed of and those absent from the ward.

*	NAME OF PATIENT.	RATE.	DISABILITY.
Adm.	SMITH, Raymond		Hernia, rt. inguinal
Adm.	ROBERTS, Harold		Appendicitis, acute
AOW	ANDERSON, James		Cholelithiasis, acute- from 4 B.
Disch.	GREGORY, Roger		Cyst, sebaceous

*A=admitted; AOW=admitted from other ward; D=duty; DD=died; IS=invalided from service; R=ran; T=transferred from hospital as a patient; TOW=transferred to other ward; L=absent on leave (or liberty); AWL=absent without leave.

16—10798

Figure 68.—Ward report.

in conjunction with the bed tag but never replaces it.

BED TAG.—This tag is placed in the holder at the foot of the bed. The information required on this form varies somewhat from hospital to hospital, but in general includes the patient's name, rate or grade, admission date, and religion. The religion is recorded for the convenience of the chaplain who makes rounds through the wards and can thus identify the patients for whose spiritual welfare he is responsible.

WARD REPORT (NMSH-9).—All naval hospitals and other medical facilities use this form to account for the movement of patients into and from the ward each 24-hour period. This report (figure 68) is checked and signed by the nurse in charge of the ward. The report must be completed by the night nurse and forwarded to the record office by 0800 daily.

Each admission, discharge, or transfer should be completely processed at the time it is made. Unless the entry is made in this manner, one or more of the entries may inadvertently be omitted. This is particularly true in large wards where the census may average 60 to 80 patients daily. The note at the bottom of the form gives the code for abbreviations such as "AOW—admitted other ward"; "TOW—Transferred to other ward," and so on.

On *admission,* the patient's name is placed on the ward roster, his name, rate, and diagnosis are entered on NMSH-9, bed cards are filled out, and his name is placed on the diet sheet (NMSH-18) and diet list. His name, rate, or grade, and diagnosis are entered on the ward log. Orders can be entered on the log after the doctor has seen the patient and outlined the treatment in the doctor's order book.

When admitted from another ward (AOW), the patient should be listed on the log and on the ward report (NMSH-9) by name, rate or rank, diagnosis, and ward from which admitted. List the name and diet on the diet sheet (NMSH-18) and diet list, according to the bed assigned him, on the ward roster. Place the bed card in the holder of the bed assigned the patient.

When *transferred to other wards* (TOW), list the name, rate, and ward to which transferred on the ward report (NMSH-Form 9) and log. Remove his name from your diet sheet and ward roster. Transfer the chart, bed card, and muster card with the patient. When a patient for any reason is to be transferred to another ward, the nurse making the transfer must contact the nurse on the ward to which he is to be transferred prior to moving the patient, as it may require some changes on the receiving ward to accommodate the patient. Do not move him until the nurse notifies you that she is ready to receive him.

On *discharge* enter the patient by name, rate or grade, and diagnosis on the ward report (NMSH-9) and on the ward log, and remove the name from the ward roster and diet list. The nurse in charge will see that the chart and all forms are completed and forwarded to the record office.

CLEARANCE SLIP.—Patients being discharged from the hospital must clear with all departments of the hospital to make certain that all obligations have been met prior to discharge. The clearance form is signed first by the ward medical officer and then by the ward nurse. The patient then takes the slip to the designated departments for check-out, leaving it finally at the desk of the officer-of-the-day.

DISCHARGE SLIP (PRNC-NNMC-66).—The officer discharge report, shown in figure 69, is a sample of the type of discharge slip used in most hospitals. A similar type is used for enlisted personnel and other patients. The slip is signed by the medical officer and should be attached to the patient's completed chart and sent to the record office. It is usually required by 1000 the day before discharge.

PRNC-NNMC-66
Rev. 11-47 - 10M

OFFICER DISCHARGE REPORT

Date_____

_____ _____ _____
NAME RANK DIAGNOSIS

DATE DISCHARGED TO: DUTY_____
HOME_____
_____ RETIRED LIST_____
SICK LEAVE_____
CONVALESCENT LEAVE_____
TRANSFERRED TO_____

To be submitted to the S.O.Q. RECORD OFFICE, ROOM 108, BUILDING 2, not later than 1000 of the day PRIOR to discharge of patient.
To be used for all patients in SICK OFFICERS' QUARTERS.

Have the HEALTH RECORD and completed CLINICAL HISTORY been sent to the RECORD OFFICE? Yes_____ No_____

Signature_____
Med. Off. in charge of case

Figure 69.—Officer discharge report.

NMSH-Form 18
(1939)

DIET SHEET.

Ward_____ _____, 19____

Total number of patients _____ _____
Regular diets in mess room _____ _____
Regular diets in ward or rooms _____ _____
Light diets _____ _____
Soft diets _____ _____
Special diets _____ _____
Liquid diets _____ _____
Milk in wards _____ _____ _____
(TOTAL.)

WARD SERVICE. (Name of patient.)	DIET.				REMARKS.
	Regular.	Light.	Soft.	Special.	

16—10795-1 ☆ U. S. GOVERNMENT PRINTING OFFICE : 1942

Figure 70.—Diet sheet.

NNMC-121
(10m)

NOURISHMENT SHEET.

WARD_____ DAY OF WEEK_____ DATE_____

Glass - ✓
Pint - P
Quart - Q
Gallon - G

ROOM	PATIENT	Fruits			Liquids										Remarks
			Orange	Apple	Apri.Nec.	Choc.Milk	Eggnog	Grapefruit	Milk	Orange	Tomato	Sip.Cream			
															Wd. Nurse.
TOTAL BULK QUANTITY															D.K. Check

Figure 71.—Nourishment sheet.

DIET SHEET (NMSH-18).—This form, shown in figure 70, is in general use throughout activities under the management control of the Bureau of Medicine and Surgery. It lists all of the special diets by patient's name and diet formula or designation, other diets, as regular, soft, and liquids, by number. There art two headings of regular diets, those served in the ward and those served in the mess hall.

Patients who cannot be discharged as fit for duty, but who do not require strict bed care and are permitted to be up and about the ward and hospital area, are often able to serve themselves in the cafeteria. Such patients usually like the more normal atmosphere of the mess hall where they may mingle with other people. Being permitted to take meals in the mess hall is a sign of health progress. Authority for mess hall privileges is granted by the medical officer, frequently upon the suggestion of the nurse who is in a position to observe and assess the ability of the patient to serve himself. It must be borne in mind, however, that such patients will usually have to carry their own trays of food and for that reason a man with a hand or arm cast or dressing, though otherwise in excellent condition, often cannot be allowed mess hall privileges. Some hospitals provide a "cripples mess" for such patients where they are able to come to the table and be served by a mess attendant.

The diet sheet is ordinarily required to be in the main diet kitchen by 0830 daily. The ordering of diets and the supervision of food service is the responsibility of the ward nurse. Practice, under supervision, in these duties must be a part of the training of the corpsman assigned to the diet kitchen detail. This assignment should not be just the drudgery of serving diets and clearing trays, but may be used as an opportunity for teaching the principles of attractive food service and the rudiments of dietetics.

DIET LIST.—This list is prepared on the ward and is used in the service of food. Each patient is listed by name, bed number, and type of diet. The diet list should be revised as necessary to prevent mistakes in service of food. Some hospitals, as a further check, place the patient's diet on the bed card.

NOURISHMENT SHEET (NNMC-121).—This form is used at the National Naval Medical Center for ordering nourishments (see figure 71). Some similar form is used in many hospitals in the Navy.

REQUISITION FOR MATERIALS (NNMC-64).—At the Naval Medical Center the form shown in figure 72 is used to order supplies from the central dressing room. A similar form or order will be found in most naval hospitals. All supplies needed for the day should be anticipated if possible and ordered at the beginning of the day, though not more than a 48-hours' supply should be kept on hand as more than this will tie up supplies in ward supply and dressing rooms. Care should be taken that sterile supplies are not kept on the ward beyond the expiration date of probable safe usage. The date on which the tray or equipment was sterilized will be found marked on the tag or wrapper.

NNMC-64
(10m)

U. S. NAVAL HOSPITAL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

Requisition for Materials from C.D.R.

Ward or Deck_____ Date_____

Signed_____

Filled_____ Signed_____C.D.R.

Figure 72.—Requisition for materials.

ORDERING EQUIPMENT AND SUPPLIES.—"Supplies" are items such as soap, cleaning powders, brushes, stationery, including administrative and charting forms, etc., which are *expendable* and are exhausted with use. The form for ordering supplies (known as "form-R," a name derived from the official designation of the form, NMS-Form-R), is shown in figure 73. On many stations, forms such as the PRNC-NNMC-118 (illustrated in figure 74), which lists the items most commonly required, are provided for the convenience of personnel charged with maintenance of adequate supplies for the departments. Those items not listed as

NMS-Form R
(1940)

(Department)

ISSUE VOUCHER

No. _____

Date _____

The following supplies (expendable) are required for use in this department:

GPO 16—16841

(Signature) _____

STOCK NO.	QUANTITY	ARTICLES	UNIT COST	TOTAL COST

Posted to:
Shelf record card _____
Stock ledger _____
Ex. analy. reg. _____

Approved _____

Total issue _____

Date _____

Received the above _____

Figure 73.—Issue voucher.

commonly used may be obtained by the regular NMS-Form-R.

When NMS-Form-R is used, the material must be listed by stock name as it appears in the supply catalogue, with stock number, and quantity. These forms ordinarily are prepared by the nurse in charge and must be signed by the medical officer in charge of the service or department to be supplied. A week's supply is ordered on a designated day each week. On the wards and in the departments all supplies are to be stored in a regular storage place and according to categories; that is, all cleaning supplies together and all stationery supplies together. All new personnel on the ward are to be familiarized with the storage areas for each classification. The nurse in charge must keep her supply room locked, issuing supplies in the required quantities as they are needed to accomplish the day's work. Otherwise she may find that wards which have not adequately stocked necessary supplies may "borrow" from her store and she will be short of meeting her own requirements.

EQUIPMENT VOUCHER.—Such items as beds, desks, tables, lamps, and the more permanent property on the ward is known as "equipment" and are not expendable.

The form for ordering equipment, illustrated in figures 75 and 76, is self-explanatory. Equipment items are known in the Navy as "property" and the ward medical officer and nurse in charge are held to strict accountability for them. At intervals an inventory is taken of all such nonexpendable property and all items of equipment must be listed. If any property is missing, the loss must be justified. For this reason, an experienced medical officer or nurse taking over a ward must check the equipment on that ward when assuming responsibility for it. Otherwise the person in charge might find himself charged with custody of items missing before he took over.

SPECIAL PURCHASE.—When supplies or equipment not ordinarily furnished by the Navy are required for the treatment of a patient or the performance of some special function, they may be procured by outside purchase. Local form No. 42, shown in figure 77, illustrates a form commonly used for such purchase. This

PRNC-NNMC - 118 Rev. 10-47-5M

NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

E. A. No._____ Vo. No._____ Date_____

DO NOT WRITE ABOVE THIS LINE

R-2 ISSUE VOUCHER

_____ Department

_____ Date

The following supplies (expendable) are required for use in this department.

_____ Officer in Charge

Stock No.	Quantity	Item	Unit	Cost
17-B-7210	_____	Batteries, dry, flashlight	One	_____
17-F-13550	_____	Flashlight, elec. with lamp and cell	One	_____
17-L-6320	_____	Lamps, 2 cell for flashlight	One	_____
21-T-290	_____	Twine, white for wrapping, 1/2 lb.	Ball	_____
29-T-1020	_____	Paper, toilet	Roll	_____
29-T-1100	_____	Towels, paper	Pkg.	_____
38-B-105	_____	Brooms, corn	One	_____
38-B-1262	_____	Brush, dust, counter	One	_____
38-B-1320	_____	Brush, hair, radiator	One	_____
38-B-3240	_____	Brush, fiber, toilet	One	_____
38-B-3610	_____	Brush, fiber, deck, scrubber	One	_____
38-B-3630	_____	Brush, fiber, hand, scrubber	One	_____
38-B-4575	_____	Brush, hair, deck, 14 in.	One	_____
38-B-4585	_____	Brush, hair, deck, 24 in.	One	_____
38-H-200	_____	Handle for deck scrubber	One	_____
38-H-235	_____	Handle for 24-in. hair brush	One	_____
38-S-500-10	_____	Swab, deck	One	_____
41-P-150	_____	Pan, dust	One	_____
42-B-24760	_____	Bucket, galvanized, 14 qt.	One	_____
42-C-2030	_____	Cans, G. I. with lid	One	_____
42-F-8700	_____	Fly swatter	One	_____
42-W-5010	_____	Wool, steel	One	_____
51-P-100	_____	Paper, Velsoap	Pkg.	_____
51-P-1095	_____	Polish, furniture	Bot.	_____
51-P-1120	_____	Polish, metal, 1 pt. can	Can	_____
51-PH-2545	_____	Powder, Sanitation, Sani-Flush	Can	_____
51-S-1530	_____	Soap, abrasive (Bon-Ami) type	Cake	_____
51-S-1645	_____	Soap, brown, laundry	Cake	_____
51-S-1730	_____	Soap, powder	Pkg.	_____
51-S-1885	_____	Soap, white (hand)	Cake	_____
53-N-200	_____	Napkins, paper, folded flat	Pkg.	_____
53-N-203-5	_____	Napkins, paper, 1/4 fold	Pkg.	_____
63-G-1440	_____	Glass, drinking, 10 oz.	One	_____

_____ Received the above

Approved_____
Executive Officer

Figure 74.—Issue voucher—PRNC-NNMC-118.

PRNC-NNMC-11
(REV.-10-47, 15M)

EQUIPMENT VOUCHER

FROM _____ DATE _____
Ward or Dept.

TO: EXECUTIVE OFFICER

It is requested that the following item(s) of equipment be _____ (see instructions

Justification: _____ on reverse of this form)

Item No.	Name and Description of Article	Quantity on hand	Quantity Requested

APPROVED _____ Executive Officer _____ Officer-in-Charge

DO NOT WRITE BELOW THIS LINE

SERIAL NO._____ EQUIPMENT VOUCHER NO. _____

Items of equipment listed below will be _____

from _____ to _____ for _____

Item No.	Stock Number	Name and Description of Article	Quantity Delivered	Total Cost

Delivered By _____ Received By _____

Entries for Recap. F. F. & E. I. Entries Made By Entered in Location Ledger By: _____

Figure 75.—Equipment voucher (face).

GENERAL INSTRUCTIONS

1. Heads of Departments or ward medical officers are held responsible for the equipment issued to the activities under their charge.
2. No item of equipment will be moved by any person from one Unit, Department, or Ward to another, except a temporary loan in an emergency, without first submitting and obtaining approval of Local Form NNMC-11.
3. The approved form will be delivered to the Finance Officer for action. A representative of that office will arrange to carry out the approved request. DO NOT MOVE ITEMS OF EQUIPMENT UNLESS A REPRESENTATIVE OF THE FINANCE DEPARTMENT IS PRESENT.

SPECIAL INSTRUCTIONS

One copy of Equipment Voucher, Local NNMC-11, will be prepared by the Unit, Department or Ward requesting movement of equipment. A separate form will be prepared for each type of movement requested although more than one item may be included on a Form 11 provided only one type of movement is required. For example if an ISSUE of an additional bed and mattress is requested, the two items could be placed on one Form 11 as all items are to be ISSUED. However, should a wheel chair be unfit for use and a new wheel chair required it would be necessary to prepare two Equipment Vouchers, NNMC-11, to cover the transaction as two types of movement are involved. One Equipment Voucher would request that item be SURVEYED, the other would request ISSUE of a wheel chair.

The following movements of equipment may be requested:

(a) ISSUED
This term will be used when requesting the issue of any items of equipment, either for temporary or permanent use in the Unit, Department or Ward.

(b) PLACED IN STORAGE
This term will be used when an item of equipment is no longer needed in the Unit, Department or Ward and is in condition fit for reissue.

(c) SURVEYED-UNFIT FOR USE
This term will be used when an item of equipment is no longer fit for use and survey is requested.

(d) SURVEYED-MISSING
This term will be used when an item of equipment is missing and cannot be located.

Note: (a) When requesting that items of equipment be Surveyed-Unfit for Use or Surveyed-Missing, it will be necessary to submit a justification in detail as to the reasons for this request.

(b) When replacement of surveyed items is required a separate Form 11 requesting an issue must be submitted.

(e) TRANSFERRED
This term will be used by the Unit, Department, or Ward requesting that an item of equipment be transferred from another Unit, Department or Ward.

(f) REPAIRED
This term will be used by the Unit, Department or Ward requesting that an item of equipment be repaired and returned for use.

Figure 76.—Equipment voucher (back).

Local Form No. 42

U. S. NAVAL HOSPITAL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

Procurement Request: Date:_____

1. It is requested that the following items be procured for (Stock) (_____Department).
(Cross out above not applicable)

Justification:_____

Item No.	Stock or Cat. No.	Quantity or Unit	Description of Item	Amount will last	Est. Tot. Cost

Submitted:_____ Total Cost_____
Head of Department.

None of the above items are in stock:_____
Materiel Officer.

Approved:

_____
Executive Officer.

Figure 77.—Special purchase form.

procurement form is ordinarily prepared by the nurse in charge, signed by the medical officer, and sent to the finance officer, who certifies that the desired item is not in stock, and sends the request on to the executive officer. The medical officer may be called upon to justify the purchase. When it is approved by the executive officer, the purchase is made by the finance officer. This process is most frequently used for the procurement of drugs or biologicals which are not on the supply table, or for equipment for special departments, as the operating room, physical therapy, and occupational therapy.

PRESCRIPTION FORM (NavMed-148).—This form, shown in figure 78, is used throughout the Navy for ordering medications which must be obtained from the pharmacy for an individual patient. It is also used for ordering stocks of narcotics, sedatives, alcohol, and poison, drugs for which the nurse is particularly accountable and which must be kept in a *locked* cupboard. These drugs are dispensed only by the nurse. The keys to this cupboard are always in the possession of the nurse in charge, who turns them over to the nurse who relieves her.

SHIP OR STATION ..... DATE ..... 19.....

FOR .....

℞ GM. OR C.C.

NO. | SIGNATURE

(MC) USN

NAVMED-148 (Rev. 4-45) 16—44256-1 ☆ GPO

Figure 78.—Prescription form.

NARCOTIC REPORT (Local Form No. 68).—As is customary in all hospitals both civilian and military, a record must be kept and a report made of all narcotics dispensed. This report is shown in figure 79. A narcotic book is kept by each ward and each entry includes the patient's name, drug, and dose given, time given, by whom given, and the name of the doctor who ordered the narcotic. This book is summarized each week at a designated time and the summary sent to the office of the chief of nursing service.

As indicated on the sample form, the summary includes the quantities of drugs remaining at last report, the quantities drawn from the pharmacy, and the amount expended. At intervals, varying in the different activities, the ward narcotic books may be called in to the chief nurse's office for inspection.

LOCAL FORM - No. 68. Date _____

NARCOTIC REPORT

NARCOTIC	L.R.	DRAWN	EXPEND
Morph. Sulph. gr. 1/4			
Atrop. Sulph. gr. 1/150			
Morph. Sulph. gr. 1/8			
Atrop. Sulph. gr. 1/200			
Morph. Sulph. gr. 1/8			
Codeine gr. 1/4 (M)			
Codeine gr. 1/4 (H)			
Dilaudid gr. 1/16			
Dilaudid gr. 1/20			
Dilaudid gr. 1/32			

Nurse _____

Figure 79.—Narcotic report.

DRUG BOOK.—Drugs other than narcotics, sedatives, and alcohol routinely used on the ward are obtained from the pharmacy each day. A book is kept for each ward, and the date, drug, and quantity required is entered with the order each morning. This drug book is usually prepared by the corpsman who dispenses medications, is checked by the nurse in charge, and signed by the ward or department medical officer. The drug book and any prescriptions are taken in the drug basket to the pharmacy and left for attention. The corpsman is usually instructed by the pharmacy concerning the time to return for the ward drug supplies.

REQUEST FOR REPAIRS (NMSH-68).—The ward medical officer uses the form illustrated in figure 80 when repairs are needed on the ward. This is a standard form in use throughout Medical Department activities.

LAUNDRY LIST.—This form is used in checking the linen sent daily to the laundry. Through the form in figure 81 is a local one, the same or a similar form will be found in use at all Medical Department activities. Soiled linen is counted and taken to the laundry with the list signed by the corpsman who made the count.

NMNH Form 68
(1946)

REQUEST FOR REPAIRS
(WORK REQUEST)

LOCATION ..... *DATE* .....

To: Executive Officer.

REQUEST:

NOTE.—Only one item to appear on this request form. *In Charge.*

To: ..... *DATE* .....

INSTRUCTIONS:

REQUEST No. .....

RECORDED .....

(M. C.) U. S. Navy, Executive Officer.

To: Maintenance Officer.

Work commenced ..... (Date) ..... (Hour) m.

Work completed ..... (Date) ..... (Hour) m.

To: Executive Officer. *DATE* .....

Inspected and found ..... satisfactory.

Maintenance Officer.

GPO 16—19271-1

Figure 80.—Request for repairs.

Here it is verified and the soiled linen exchanged for clean. Each ward and department has a linen supply "on charge" to it, and the ward nurse is accountable to the chief of nursing service for its control.

In order to control losses, it is wise to manage all linen on an exchange basis. Patients are issued clean towels and pajamas from the ward linen room in exchange for soiled ones. This reduces the tendency of patients to appropriate pajamas and towels for their personal use. Bed linen is issued to the nursing personnel responsible for the patient, and the soiled linen is turned in when it is removed from the bed. The linen room should be kept locked, and the key should be in the custody of the nurse in charge, or the corpsman on linen room detail, who will issue the linen routinely each day and as required at other times. Linen losses, particularly blankets, add up to a considerable

LAUNDRY LIST
PRNC-NNMC-87

U. S. NAVAL HOSPITAL
NATIONAL NAVAL MEDICAL CENTER

DATE

ACTIVITY

ARTICLES	NUMBER 1	2	3	4
APRONS				
BATH MATS				
BATH ROBES				
BEDSPREADS, LARGE				
BEDSPREADS, SMALL				
BINDERS				
BLANKETS				
BOOTS				
BUREAU SCARFS				
CAPS, MESS				
CAPS, OPERATING				
CLOTHS, FIELD				
CLOTHS, TABLE, LARGE				
CLOTHS, TABLE, SMALL				
CLOTHS, WASH				
COATS, LABORATORY				
COATS, MESS				
COVERS, BED-HEAD				
COVERS, BEDPAN				
COVERS, CHAIR, LARGE				
COVERS, CHAIR, SMALL				
COVERS, GLOVE				
COVERS, HOT-WATER BAG				
COVERS, ICE-BAG				
COVERS, MATTRESS				
COVERS, PILLOW				
COVERS, SCREEN				
COVERS, TABLE, BEDSIDE				
CURTAINS, BATH				
GOWNS, OPERATING				
LAUNDRY BAGS				
MOPS, DUST				
NAPKINS				
PAJAMA COATS				
PAJAMA PANTS				
PILLOW CASES				
RX GOWNS				
SHEETS				
TOWELS, BATH				
TOWELS, DISH				
TOWELS, HAND				
TOWELS, MEDICINE				
TURKISH PADS				
UNIFORMS, MAID				
WRAPPERS, LARGE				
WRAPPERS, SMALL				
MISCELLANEOUS				

COLUMN NO.	COUNTED BY
1	
2	
3	
4	

Figure 81.—Daily laundry list.

Local Form No. 108

ITEM	00	00	04	05	Dr. Of. 09	Utility	12	15	18	19	21	24	28	30	Kitchen	Linen Room	Soiled Linen in Laund.	Total
BEDSPREADS																		
BLANKETS																		
BUREAU SCARFS																		
BATH MATS																		
BATH ROBES																		
MATTRESS COVERS																		
PILLOW COVERS																		
PAJAMA COATS																		
PAJAMA PANTS																		
PILLOW CASES																		
CHAIR BACK COVERS																		
SHEETS																		
BATH TOWELS																		
HAND TOWELS																		
DISH TOWELS																		
LAUNDRY BAGS																		
BATH CURTAINS																		
WASH CLOTHS																		
AFGHANS																		

4-82

Figure 82.—Weekly laundry list.

amount of money and every effort must be made to keep losses at a minimum.

In addition to the daily count of linen to be exchanged, the entire linen supply on the ward or department is inventoried each week. This report is signed by the nurse in charge and sent to the supervisor's or chief nurse's office. The count is entered also in the linen book kept on the ward. The sample form, illustrated in figure 82, is used for the weekly laundry report to the supervisor or chief nurse.

WARD SCHEDULE.—This schedule indicates the time for routine medications; for service of food and nourishments; for temperature, pulse, and respirations schedules; for baths, and routine care to patients; for morning and afternoon sick call; and for other regular routine functions attendant upon the care of the patients and the administration of the ward. A suggested schedule follows:

SUGGESTED WARD SCHEDULES

0600.—Routine a.m. care to patients.
T.P.R.'s.
A.m specimens collected. A.m. and overnight specimens forwarded to laboratory.

0630.—Reveille for all enlisted patients who are up and about the ward.
A.C. medications.

0645.—Breakfast for patients who are served on the wards.

0715.—Breakfast for patients who can go to mess hall for meals.

0730.—P.C. medications.

0800.—A.m. sick call by ward medical officer begun. This sick call is a daily event and varies in time from hospital to hospital, and to some extent on the various wards of the hospital. The charge nurse and usually the senior corpsman accompany the medical officer on his rounds and assist as needed during sick call. The charge nurse records the orders in the doctor's order book during ward rounds, and at the completion of sick call the medical officer checks and signs the order book.

All patients' special requests (leave slips, special liberty, etc.), requisitions, requests for repair, and other papers requiring medical officer's signature are submitted at this time, and when signed are distributed to the proper activity for action.

The log, including the night report, is presented to the medical officer for review before beginning sick call. He should read and sign the log and the reports.

Other personnel continue the care of the patients and put the ward in order.

1000.—T.P.R.'s.
A.m. nourishments.
Chief nurse or supervisor makes rounds.

1030.—A.C. medications.

1100.—Noon meal.

1145.—P.C. medications.

1300.—Ward, diet kitchen, and utility and service rooms policed (put in order).

1400.—T.P.R.'s.
P.m. nourishments.

1500.—P.m. staff assume the duty.

1630.—A.C. medications.
P.m. care to bed patients.

1700.—Supper.

1750.—P.C. medications.

1800.—Ward, diet kitchen, and utility and service rooms policed.

1900.—P.m. sick call, made by the officer of the day.

2100.—Night enlisted staff assumes the duty.
Bed check by senior man on watch, made with the night man. Lights out.

2200.—Night routine.

In case of emergencies of any circumstance requiring the services or advice of a medical officer after the ward medical officer leaves for the day, the nurse in charge will notify the officer of the day.

Before going off duty the night nurse will insure that the morning routine is in operation. She will leave a written and signed report of any incident worthy of note in relation to the care of patients during the night. As indicated previously, where there is one nurse responsible for more than one ward during the night, the log may be kept by the corpsman on the ward, signed by him and countersigned by the night nurse.

The night crew, as is the case in most hospitals, civilian as well as military, is responsible for the collection and forwarding to the laboratory any routine or special night or early a.m. specimen.

The night nurse carries all keys to locked cupboards (as narcotics) and dispenses all such drugs, making sure that proper record is made.

As would be expected, the foregoing schedule is subject to variation depending upon the routine and schedules in effect in the hospital or activity to which a nurse is assigned. It is offered as a sample only.

CORPSMEN DETAIL.—In accordance with the principles outlined earlier in this chapter, this form designates the duties of each corpsman assigned to the ward. It should be revised as indicated, keeping it up-to-date at all times.

CLEANING DETAIL.—In most hospitals, the enlisted personnel assigned to the ward are responsible for the cleaning and housekeeping on the ward, in addition to the care of patients. It is necessary that a cleaning detail and schedule be posted for the reference of the personnel. A sample is outlined:

CLEANING SCHEDULE

DAILY	WEEKLY
	Monday
1. Galley (diet kitchen), including preparation and service of trays. Scrub deck in mornings and swab after every meal. Wash silver and glasses.	Scrub Venetian blinds. Scrub wastebaskets. Scrub baseboards in the rooms and ward. Clean radiators.
	Tuesday
2. Linen room. Count soiled linen and exchange for clean. Wash linen closet shelves on Wednesday.	Polish furniture. Clean mirrors. Change shower curtains. Clean closets and dressers.
	Wednesday
3. Utility room, including care of all equipment. Scrub deck daily.	Scrub beds (dust bed springs). Clean spots from walls and woodwork. Wash tops of dressers and bedside tables.
	Thursday
4. Supply locker. Clean, care and storage of supplies.	General field day. Check all details of cleanliness and order of the ward. Polish decks. Dust furniture thoroughly.
	Friday
	Be ready for inspection at specified time. All hands to be in the uniform of the day.

All work assigned is to be completed before the corpsman reports off the ward. Each corpsman is to report to the charge nurse prior to leaving the ward. Dry swab and dust rooms each day as part of the routine of caring for the patient. Swab, wax, and polish decks by Thursday of each week. Each shift of corpsmen must leave the ward in good condition for the next crew.

This schedule may vary somewhat from station to station, but it illustrates the general principle of preparing a cleaning and work schedule. The patient assignment is made in accordance with the principles of teaching and experience outlined earlier in this chapter.

MUSTER REPORT OF HOSPITAL CORPSMEN.—This form varies with the hospitals. In some instances, all corpsmen are mustered by the chief on watch before they report for duty; in others the report similar to the one shown here is prepared and signed by the charge nurse.

NNMC-104
(10m)

WARD OR DEPARTMENT:

DATE

0800 REPORT MUSTER OF HOSPITAL CORPSMEN

/s/ _____

Figure 83.—Report muster of hospital corpsmen.

VERBAL REPORTS BETWEEN NURSES.—Based on information in the log and any related matters, these reports are made by the day charge nurse to the afternoon nurse, the afternoon nurse to the night nurse, and the night nurse to the day charge nurse. This custom is general in hospitals in civil life as well as in the Navy, and will be familiar to all.

PATIENTS' RECORDS.—In addition to those administrative reports necessary to provide a smoothly functioning environment for the patients, a number of records directly concerned with the individual patient and his illness must also be maintained by the nurse. First and foremost of these records is, of course, the patients' clinical chart and record (figures 84, 85, and 89). A complete chart is illustrated in these pages in order that the nurse new to the Navy may become familiar with these records. The charge nurse is responsible for seeing that

charts are available at all times, for filing the reports properly, for transferring all orders written in the doctor's order book to the order sheet of the chart, and for insuring that nursing notes and graphic sheets are up to date at all times. These duties should be delegated as practicable to the hospital corps staff on the ward.

Each hospitalman should be taught to keep a complete and accurate chart on the patients assigned to his or her care, but the nurse is administratively responsible for these duties and must check daily to make sure that such delegated responsibilities are being properly met. As indicated on the sheets, NavMed-HF-59, NavMed-Form Q, NavMed-HF-17 (figures 84, 85, and 86) are forms in general use throughout the Navy. The remaining forms (figures 87, 88, and 89) are local ones which have a counterpart in other naval activities. In the case of a patient on the serious or critical list, it is customary to record the fact, including the date, on the face sheet of the chart (NNMC-72), illustrated in figure 89.

Individual charts and the patient's records in the Navy are very important since they may determine whether the patient is eligible for disability retirement, and they also serve to screen out those people who are not entitled to retirement, or to indicate malingering. It is therefore very essential that all individual records be kept with complete accuracy, so that fair conclusions may be drawn from the material recorded.

U. S. NAVAL HOSPITAL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

WARD _____

NAME AND RATE OR RANK _____

RELIGION _____

DATE OF ADMISSION _____

DIAGNOSIS _____

DATE OF OPERATION (IF ANY) _____

DATE OF DISCHARGE _____

Figure 84.—Face sheet of patient's record.

Patients are admitted to wards in naval hospitals according to diagnosis, for most naval hospitals are large enough in size to permit segregating services. The patient, then, normally comes under the medical care of the doctor in charge of the ward. When, as frequently happens both in the Navy and in civilian life, the opinion of another medical officer or treatment from a special department is desired, the special examination and treatment request (NavMed-HF-57), shown in figure 90, is prepared and signed by the ward medical officer. This is a standard form used throughout the Medical Department activities of the Navy. Some hospitals, however, have local forms for specific reports or procedures. Local form No. 205, request for electroencephalogram and local form No. 230, X-ray consultation request, are illustrations of these (figures 91 and 92, respectively). Both forms provide space for the report of the examination requested.

LABORATORY EXAMINATION (NavMed-HF-27).—The standard form, shown in figure 93, is in use throughout the Navy for requesting and reporting laboratory procedures. As with special examination requests, some activities such as the larger naval hospitals and the Bethesda Naval Medical Center, where large research and diagnostic laboratories are available, may require special forms for specific procedures. The additional data is of use in tabulating research findings. The request for laboratory procedures, as with all examination requests and charts, must be made out in ink or typed. Special forms must be completely filled in.

When form 27 is used, in addition to supplying the required information, it is necessary to indicate whether the patient is up and about the ward or confined to bed. The special forms, illustrated in figures 94 to 100, inclusive, have a space for checking this information, but on a regular form 27 it must be written in. "Up" patients are usually required to report to the laboratory for examinations, but in the case of a bed patient the laboratory technician will come to the bedside to obtain blood, gastric, or other specimens which must be withdrawn. Stool and sputum specimens are sent to the laboratory.

In the case of special examinations, X-rays, or special treatments, it is necessary to ascertain the pretreatment or pretest orders. This applies for such procedures as blood chemistry, some X-rays, and various other tests for which special preparation is usually required.

The form, illustrated in figure 101, is used in the blood bank at the Naval Medical Center.

NAVMED HF-59
(1943)

Page No. _____

CLINICAL RECORD

Name _____ Rate _____

The medical officer shall enter or dictate for entry in this record: (1) A concise history from the health record and patient; (2) the findings on complete physical examination; (3) all important laboratory, x-ray, and other clinical findings; (4) the treatments and diets ordered or discontinued; (5) changes in condition and diagnosis; (6) condition on discharge or transfer or, in case of death, the autopsy findings (when practicable).

This record shall be signed by each medical officer making entries therein and filed in the clinical jacket.

DATE	

Figure 85.—Clinical record.

NAVMED-Form Q
(1943)

CLINICAL CHART

Page No. .....

Name ..... Rate .....

Diagnosis ..... Race ..... Age .....

Year and Month																								
Day of Month																								
Day of Disease																								
TIME A.M. P.M.																								
TEMPERATURE 106°																								
105°																								
104°																								
103°																								
102°																								
101°																								
100°																								
99°																								
NORMAL 98°																								
97°																								
PULSE 160																								
150																								
140																								
130																								
120																								
110																								
100																								
90																								
80																								
NORMAL 70																								
60																								
RESPIRATION 50																								
45																								
40																								
35																								
30																								
25																								
20																								
NORMAL 15																								
10																								
Urine																								
Stools																								

Day after Operation may be entered in red in the space for Day of Disease.
Draw heavy lines to separate calendar days.

16—10123-1 ☆ GPO

Figure 86.—Clinical chart.

CLINICAL NOTES
NAVMED-HF-17 (REV. 6-43)

PAGE No. _____

INSTRUCTIONS.—The nurse shall record nourishment and treatment as administered. When these are not given in accordance with the ward order book, the reasons shall be entered in the last column. "Remarks" shall also include entries as to the patient's condition as observed by the nurse.

NAME _____ RANK OR RATE _____ WARD _____

DATE	HOUR	NOURISHMENT	TREATMENT	REMARKS

INTAKE & OUTPUT CHART
PRNC—NNMC—19

TIME	INTAKE	OUTPUT	TIME	INTAKE	OUTPUT
0100			1300		
0200			1400		
0300			1500		
0400			1600		
0500			1700		
0600			1800		
0700			1900		
0800			2000		
0900			2100		
1000			2200		
1100			2300		
1200			2400		
DATE			TOTAL	CC.	CC.

PRNC-9-9-48-14M

Figure 88.—Intake and output chart.

NNMC-243
(4m)

U. S. NAVAL HOSPITAL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

AUTHORITY TO PERFORM OPERATION OR AN OPERATIVE PROCEDURE

Date _____

This is to certify that (I) (we) the undersigned consent to the Administration of whatever Anesthetics and to the performing whatever operation or operative procedures including spinal puncture that are considered necessary in the treatment of my case.

_____ _____
(NAME) (ADDRESS)

Signature of Patient _____

Signature of Relative _____ Relationship _____

- -

NOTE: This form to be completed prior to operation or spinal puncture on all non-service personnel and filed with the patient's record. If the patient is a responsible adult, he must sign personally; if an adult and unconscious or irresponsible, the nearest relative should sign the authority; in case of a minor, the parent or legal guardian should sign the authority.

Figure 89.—Authority to perform operation.

SPECIAL EXAMINATION AND TREATMENT REQUEST

NAVMED-HF-57 (REV. 6-45)

Special forms and outlines may be stamped on front and back

HOSPITAL
FILE NO.

NAME	RANK OR RATE	WARD	DATE

DIAGNOSIS	REFERRED TO

EXACT EXAMINATION OR CONSULTATION DESIRED

Signature.....(MC)USN

REPORT OF EXAMINATION OR CONSULTATION

Date ..... *Signature*.....(MC)USN

☆ U. S. GOVERNMENT PRINTING OFFICE 16—44870-1

Figure 90.—Special examination and treatment request.

Local Form No. 205

REQUEST FOR ELECTROENCEPHALOGRAM

File No._____
Date of Request_____ U. S. Naval Hospital_____

NAME: Rate: Ward:

DIAGNOSIS:

Referred by: (MC)USN

REPORT

Date of test:

Attitude and condition of patient:

Procedure: monopolar ( ) bipolar ( )

Electrode placement:







Fundamental frequency:

SLOW WAVES:

Fast waves:

Amplitude characteristics:

Additional features and remarks:

Hyperventilation:

IMPRESSION:

(MC)USN

Figure 91.—Request for electroencephalogram.

A similar type of card is found at most large activities having blood bank facilities.

CHANGE IN DIAGNOSIS (Local No. 226).—Patients are sometimes admitted on a provisional diagnosis, or with diagnosis undetermined, and in such cases an official change of diagnosis may be necessary. This slip, illustrated in figure 102, is prepared by the medical officer who changes, or establishes, the diagnosis. It is sent, with the patient's chart, to the record office. *All charts* taken or sent out of the precincts of the ward should be listed in a book kept for the purpose, and the listing should designate to whom the chart was sent. Upon return, it should be checked in.

Local Form No. 230 (Rev. 9-47) U. S. NAVAL HOSPITAL BETHESDA, MARYLAND

Diagnosis ☐ Therapy ☐ X-RAY CONSULTATION REQUEST* Routine ☐ Emergency ☐ Board Room ☐ Mobile ☐

NAME_____RATE_____WARD_____
(Print) Last First Middle
Telephone Report To_____

AGE____HT.____WT.____Send Report To_____

PREVIOUS X-RAYS: No.____Yes____Year____X-RAY FILE NO._____
(In this hospital) (From previous X-ray reports)

EXACT ANATOMICAL PART TO BE EXAMINED_____
(Please be accurate)

CONDITION SUSPECTED (Tentative diagnosis)_____

HISTORY (Pertinent)_____

PHYSICAL EXAMINATION (Positive findings)_____

CONSULTATION (Pertinent)_____

REQUESTED BY_____DATE_____
(MC) USN

*All blanks above must be completely and correctly filled out before request will be accepted.

Figure 92.—X-ray consultation request.

SERIOUS AND CRITICAL LIST.—When a patient is adjudged to be in a serious or critical condition the medical officer will so indicate. At this time a special form (figure 103) is completed by the medical officer designating the patient as "serious" or "critical." These forms are sent immediately to the office of the officer-of-the-day. *In all cases* these patients are seen by the chaplain of their faith. If the chaplain does not arrive at the patient's bedside within a reasonable time, it is the nurse's responsibility to make sure that he has been notified. The possessions, including clothing, of patients placed on the serious or critical list are inventoried and their money and valuables are turned over to the officer of the day for safekeeping. He returns a receipt for these articles.

HEALTH RECORD RECEIPT (LOCAL FORM NO. 14).—Because the health record is so important a part of the records of an individual in naval service, special care must be given to insure that it is not lost. The form illustrated in figure 104 is a local one used at the Naval Medical Center. Such a form may not be in use at every naval activity, but some similar system of accountability is usually found.

LIBERTY LIST.—In the Navy a man is either fit for full duty or he remains a patient. For this reason, naval hospitals usually have a larger proportion of convalescent patients than those in civilian life. These patients are sometimes permitted liberty to leave the hospital for stated periods at designated times. This list is signed by the ward medical officer who thus accepts responsibility for the patient's fitness to leave the hospital for a limited time. The original of this form goes to the master-at-arm's office by 1000 the day previous to liberty.

Since the patient who is able to go on liberty and who wants to go is usually able to perform light duty on the ward, the wise nurse will not delegate preparation of the liberty list to anyone else, for the recommendation for liberty can be used as a means of enforcing discipline among patients. It is best to check the list of patients who request liberty with the senior corpsman to make sure that patients who rate liberty and who are cooperative in assisting with the work on the ward are included. Those who are uncooperative about their bed area, their person or possessions, and about assuming their share of the chores within their physical capacity, are pointed out to the ward medical officer with the recommendation that they be deleted from the list.

ABSENTEE REPORT.—Any patient absent from the ward without liberty, is placed on the absentee report which must be sent to the master-at-arm's office by 0830 daily. A check of all patients is made daily at 2100, and any patients absent from the ward and not on the liberty list are reported to the chief of the watch or the officer-of-the-day, as the regulation may be in the hospital to which you are attached.

LABORATORY EXAMINATION
NAVMED-HF-27 (REV. 8-45)

Use separate slip for each specimen.
Special forms may be stamped on front and back.

NAME _____ RANK OR RATE _____ WARD _____

DIAGNOSIS

SPECIMEN SUBMITTED (*check*):

☐ URINE ☐ BLOOD ☐ GASTRIC CONTENTS
☐ FECES ☐ SPUTUM ☐ PUS ☐ SPECIAL

EXACT INFORMATION DESIRED:

DATE _____ _____ (MC) U. S. N.

DATE _____ _____ (MC) U. S. N.

☆ U. S. GOVERNMENT PRINTING OFFICE 16—45051-1

Figure 93.—Report of laboratory examination.

☐ Up patient
☐ Bed patient

BLOOD COUNTS
Department of Hematology
Naval Medical School
National Naval Medical Center, Bethesda, Maryland

NNMC-196
(40m)

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:

_____(MC), U.S.N.

LABORATORY REPORT Date_____

RBC_____
WBC_____
Hgb._____Grams_____%
Neutrophil s:
Myelocytes_____
Juvenils_____
Band Forms_____
Segmented_____
Lymphocytes_____
Monocytes_____
Eosinophils_____
Basophils_____

Platelets_____
Bleeding time_____minutes_____sec.
Coagulation time_____minutes_____sec.

Special examinations and comment:

_____(MC), U.S.N.

Figure 94.—Report of blood counts.

☐ Up patient
☐ Bed patient

STOOL SPECIMENS AND MALARIA — Local Form #191.

Department of Parasitology
Naval Medical School
National Naval Medical Center, Bethesda, Maryland

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:

_____(MC), U.S.N.

LABORATORY REPORT

Feces	Blood
Consistency:	Malaria:
Gross appearance:	Species:
Helminths:	Parasite density:
Protozoa:	Microfilaria:
Occult blood:	Date_____ _____(MC), U.S.N.

Figure 95.—Report of stool specimens and malaria.

☐ Up patient
☐ Bed patient

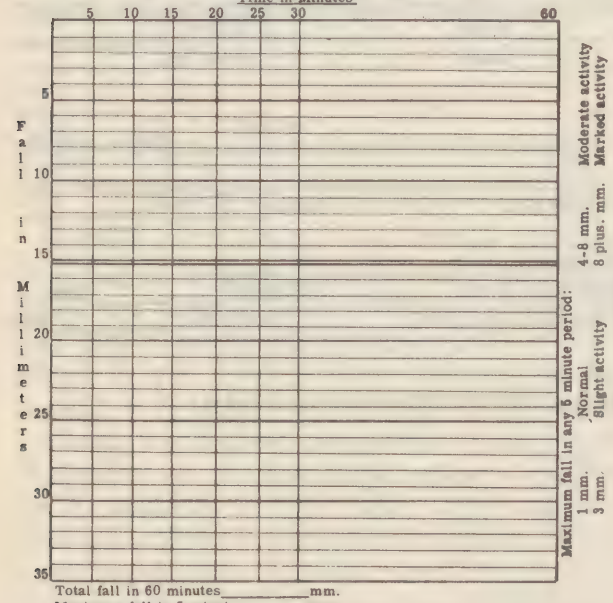
BLOOD SEDIMENTATION — Local Form #198.

Naval Medical School
National Naval Medical Center, Bethesda, Maryland

Name_____ Rate_____ Ward_____
Date_____ Diagnosis_____ Bed No._____

_____(MC), U.S.N.

BLOOD SEDIMENTATION RATE (CUTLER)
Time in Minutes



Total fall in 60 minutes_____mm.
Maximum fall in 5 minutes_____mm.

Date_____ _____(MC), U.S.N.

Figure 96.—Report of blood sedimentation.

FUNCTIONS OF SUPERVISORY PERSONNEL

Similar educational background and professional experience is required of the *nursing supervisor* in the Navy as in civil life. The Navy supervisor is usually a nurse with the rank of lieutenant or above. However, not all lieutenants are assigned to supervision and some nurses below the rank of lieutenant who have preparation in special clinical or administrative fields supervise hospital areas devoted to their specialties.

In some hospital organizations nursing supervisors have their headquarters in the office of the chief of nursing service; in others, the supervisors are assigned to special sections of the hospital and have an office in that section, reporting at intervals to the chief of nursing service. The latter plan is particularly effective when the supervisory staff includes nurses with special clinical preparation, for in many naval hospitals the wards devoted to a major clinical specialty such as medicine, surgery, psychiatry, etc., are often as large as small hospitals. For example, during the period of 1 month in 1948 a large naval hospital had a daily average cen-

sus of 115 orthopedic patients; 146 medical patients (not including tuberculosis and contagion cases), and 198 surgical patients.

In an activity as large as this, and with supervisors of proven competence, the chief of nursing service may assign a group of nurses to the supervisor who makes out duty rotations and schedules for her staff, submitting copies of each for the approval of the chief of nursing service. Such decentralization is very desirable in a large activity where the chief nurse cannot possibly exercise the close supervision found in the smaller activity. Such an arrangement provides a more effective supervisory situation in that the superior is able thus to keep in touch with all of the nurses in a given area, to coordinate their activities, and to assist and teach them as needed.

Whatever plan of supervision is followed, it is the general function of the supervisor to analyze and evaluate the nursing service required in the hospital area to which she is assigned, and to facilitate meeting these service needs. To this end she makes frequent rounds on the wards, giving particular attention to assisting the new nurses with their administrative duties. New nurses are assigned for a period of formal indoctrination when they report for their first Navy duty, but the supervisor is expected to take up the training where the nurse in charge of indoctrination classes left off, following up the practices taught during the indoctrination period.

Along with teaching and follow up work among the new nurses the supervisor should assist in the preparation and review of materials to be included in on-the-job training plans carried on by the ward nurses for the benefit of enlisted Hospital Corps personnel and any auxiliary workers on the ward. Many Navy manuals and teaching guides are available to the nurse who, like every other naval officer, discharges the dual responsibility of training subordinate personnel and practicing the profession for which she is educated.

Much useful assistance for on-the-job teaching is to be found in the *Shipboard Training Manual* (NavPers 90110-March 1948). This is particularly applicable to the officers who are new to teaching, and this group will include a

☐ Up patient
☐ Bed patient

BLOOD CHEMISTRY
Department of Physiological Chemistry
Naval Medical School
National Naval Medical Center, Bethesda, Maryland

Local Form #190.

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:

_____ (MC), U.S.N.

Blood Chemistry		
Total Serum Proteins	Gms.	%
Serum Albumin	Gms.	%
Serum Globulin	Gms.	%
Non Protein Nitrogen	Mgs.	%
Urea Nitrogen	Mgs.	%
Uric Acid	Mgs.	%
Creatinine	Mgs.	%
Glucose	Mgs.	%
Chlorides	Mgs.	%
Cholesterol	Mgs.	%
CO_2 Combining Power	Vol.	%
Van den Bergh		
Indirect-Bilirubin	Mgs.	%
Direct-Type of Reaction		
Salicylates (Plasma)	Mgs.	%

Sulfonamides - Specify Drug Administered		
(_____)	Mgs.	%
Serum Calcium	Mgs.	%
Inorganic Phosphorus	Mgs.	%

Spinal Fluid Chemistry		
Glucose	Mgs.	%
Chlorides	Mgs.	%
Proteins	Mgs.	%

Special Tests

_____

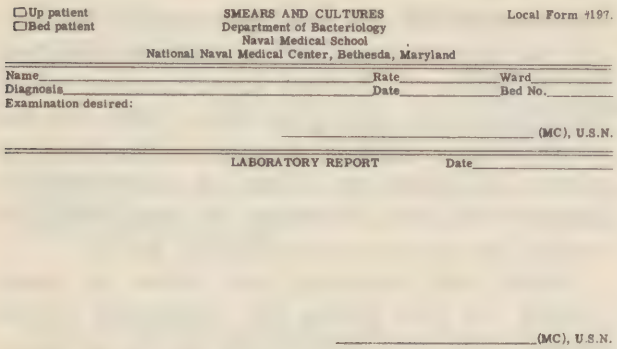
_____

_____

_____ (MC), U.S.N.

Date_____

Figure 97.—Report of blood chemistry.



☐Up patient
☐Bed patient

SMEARS AND CULTURES
Department of Bacteriology
Naval Medical School
National Naval Medical Center, Bethesda, Maryland

Local Form #197.

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:

_____ (MC), U.S.N.

LABORATORY REPORT Date_____

_____(MC), U.S.N.

Figure 98.—Report of smears and cultures.

great proportion of the new nurses in the Navy. Written in a readable style the *Manual* outlines and explains the fundamental principles of teacher-student contact in an on-the-job teaching situation and the preparation and presentation of teaching materials. Though written for use of instructors aboard ship, it is applicable to the nursing situation, to the nurse—hospitalman teaching relationship and to the supervisor-nurse relationship.

The supervisor is the link between the nurses on the wards under her charge and the chief of nursing service. It is her function to pass on instructions from the chief nurse and to keep the chief nurse informed on problems met by individual nurses in the daily activities on the wards. Although the nurses have direct access to the chief nurse, it should not be necessary to exercise this privilege if the supervisor is filling her post adequately.

The *chief of nursing service* is assigned to the position by the Bureau of Medicine and Surgery. She is charged with the responsibility of maintaining the highest possible standards of patient care and personnel practices among her nurses. She is responsible to the medical officer in command and to the executive officer of the hospital. She operates as a chief of service and as such is a member of the professional staff conference. Her professional function is to direct the nursing service and to coordinate its activity with that of the other professional staffs of the hospital.

In the administration of these duties she organizes, directs, and supervises the nursing care of all patients within the hospital. This involves the assignment, with the approval of the executive officer, of nurses to their specific wards, departments, and duties; definition of the duties of nursing and auxiliary nursing

☐ Up patient
☐ Bed patient

SEROLOGICAL DEPARTMENT
Naval Medical School
National Naval Medical Center, Bethesda, Md.

Local Form #193.

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:_____

_____.(MC), U.S.N.
Address_____

Space below Reserved for Laboratory Report

Kahn Presumptive_____ Davidsohn Test_____
Kahn Standard_____ _____
Kahn Units_____ Blood Group_____
Kolmer_____ Remarks:_____
_____ _____
_____ _____
_____ _____
Mazzini_____ _____
Complement Fixation for_____ _____
_____ _____
_____ _____
_____ _____U.S.N.

Figure 99.—Seriological department report.

☐ Up patient
☐ Bed patient

URINALYSIS
Department of Physiological Chemistry
Naval Medical School
National Naval Medical Center, Bethesda, Maryland

NNMC-195
(50m)

Name_____ Rate_____ Ward_____
Diagnosis_____ Date_____ Bed No._____
Examination desired:

_____(MC), U.S.N.

ROUTINE AND MICROSCOPIC

Quantity: 24 hrs._____ Date_____
Color_____ Transparency_____
Reaction_____ Spec. Grav._____
Albumin_____, _____mg. percent.
Sugar_____, _____mg. percent.
Occult Blood_____, _____plus reaction.

Casts_____
Mucus Threads_____ Cylindroids_____
Leucocytes_____per HDF.
Erythrocytes_____per HDF.
Epithelium Cells_____
Crystals_____

SPECIAL TESTS

_____(MC),U.S.N.

Figure 100.—Urinalysis report.

NNMC-141-5M

U. S. NAVAL MEDICAL SCHOOL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

A. REQUEST FOR BLOOD Date_____
(Send to Blood Bank, Room 326)

Name_____ Sex_____ Rate_____ Ward_____
Date and time blood needed_____ Total amount required_____
Diagnosis_____
Indications for transfusion_____
Previous transfusions?_____ Dates_____ Reaction?_____ Allergy_____

_____ _____
Medical Officer Requesting Transfusion Chief of Service

B. LABORATORY DATA Date_____

Recipient_____ Blood group_____ Rh factor_____

Donor: Bottle No._____ Blood group_____ Rh factor_____
Cross-match_____

_____ _____
Technician Laboratory Officer

C. POST-TRANSFUSION DATA Date_____

Temperature at start of transfusion_____
Blood, amount given_____cc. Time started_____ Completed_____
Reaction: No_____ Yes_____ Onset_____ Duration_____
Symptoms_____
Remarks_____

Signed_____ MC USN
(over)

Figure 101.—Request for blood.

personnel; and maintenance of records of the professional qualifications, experience, and special training of all nursing personnel in order that each may be utilized to fullest professional capacity and satisfaction. The chief nurse or the supervisors under her direction daily visit all stations to which nurses are assigned for duty. This daily supervision is in addition to the duty of the chief of nursing service to accompany the medical officer in command in his formal inspection of the hospital or activity.

The standards of nursing care in any hospital or medical activity are in direct relation to the education and experience of the nursing personnel. For this reason the chief of nursing service is expected to establish, or designate a nurse qualified to establish, an educational program for the benefit of the nursing personnel. The on-the-job training of Hospital Corps and auxiliary personnel is a part of this program. An in-service program for the benefit of the professional nursing staff should be concurrent with this program. This in-service program may utilize the media of staff conferences, when it can be arranged, the services of specially prepared nurses on the staff, the medical staff, the social workers and welfare staff, guest lecturers from nearby universities, or the extension facilities of universities. The educational-services officer for the hospital or naval station may often be in a position to assist in securing special lecturers or facilities.

Where residency programs for the training of medical officers in clinical specialties are in effect the facilities for instruction and the teaching personnel connected with these programs can often be adapted to the particular needs of the nursing staff. One does not stand still in nursing any more than in any other field of endeavor. Unless forward steps are taken, you can be sure that ground will be lost. An active in-service training program for all categories of personnel is one of the marks of a progressive and alert professional administration. Certain formal educational opportunities are available to career members of the regular Navy Nurse Corps, and these will be discussed in full in another section.

Local No. 226

NOTICE OF CHANGE IN DIAGNOSIS

_____ 19____

To: Record Office

NAME_____ Rank or Rate_____

DIAGNOSIS CHANGED From_____ Diag.No._____

To_____ Diag.No._____

How is new diagnosis to be recorded? ACD_____ EC_____ AD_____ FS_____

REASON FOR CHANGE (Check)

Return to Former status_____
Error_____
Concurrent_____
Intercurrent_____
Complication_____
Sequela_____
Diagnosis established_____
Convalescent Leave_____

If complication or sequela, give primary cause:_____

Is disability the result of own misconduct?_____

If venereal, give date first taken up for present infection under any title_____19____

Did condition exist prior to entry in service?_____If YES, has prior readmission for disability been made?_____ If YES, give date_____19____

_____
(MC), U.S. Navy

Figure 102.—Notice of change in diagnosis.

The chief of nursing service is expected to look out for the health and welfare of the nurses under her supervision. This includes recommendations to the medical officer in command with regard to the living quarters of the Nurse Corps officers. In most hospitals the nurses are housed in special quarters with their own mess. At dispensaries at naval stations and certain other activities the nurses are housed in the women officer's quarters (if there are Waves or Marine officers assigned to the station or at bachelor officer's quarters (B.O.Q.). In these cases, the quarters are similar to a hotel and meals are taken at the mess (dining room) operated as a function of the W.O.Q. or the B.O.Q.

There are certain other administrative duties which customarily fall to the chief nurse. One of these is the control of linen usage in the wards and departments to which nurses are assigned. As previously explained, linen losses amount to considerable money unless particular care is taken to keep them at a minimum. Since the nursing service more than any other group is closely concerned with linen usage, the chief of nursing service normally formulates the policies concerned with its control. As a measure of control, she directs that the weekly linen count be made and a record maintained in each ward or department, and that weekly reports be made to her.

As with any other department head, the chief of nursing service is expected to foster professional and social relationships between Nurse Corps officers on her staff and the pro-

fessional organizations in the locality. This she does by encouraging attendance at professional meetings and membership in the local nursing groups. The Bureau of Medicine and Surgery expects that all members of the Nurse Corps will maintain current professional registration and good standing.

COLLATERAL DUTIES OF NURSE CORPS OFFICERS

Collateral duties of Nurse Corps officers include anesthesia, physical therapy occupational therapy, dietetics, and flight nursing.

Nurses designated as *anesthetists* in the Navy have completed prescribed courses in anesthesia and have passed the qualifying examination for membership in the American Association of Nurse Anesthetists. No other nurses are designated for this duty by the Bureau of Medicine and Surgery, and none other are expected to be so assigned. The bureau accepts responsibility only for properly qualified specialists, and if others not properly qualified are assigned locally to such duties it is the responsibility of the cognizant command.

Physical therapy duties in naval medical department activities are frequently performed by nurses who have completed accredited courses in this field and have demonstrated their competence. It is expected that eventually these duties will be assumed by members of the Medical Service Corps who are qualified physical therapists. Before the passage of the law creating the Medical Service Corps of the Navy, training in physical therapy and the performance of these duties was a function of the Nurse Corps. It is expected that nurses qualified in physical therapy work will continue in these duties as long as their services are required.

At the close of World War II when the permanent status of the Waves, who had largely staffed *occupational therapy*, was in doubt, it became necessary for the Bureau of Medicine and Surgery to make other arrangements for carrying on this important work. Accordingly, two classes of nurses, since nurses were the only women with permanent status in the Navy, were awarded accredited courses in occupational therapy. It is planned that these duties will eventually be performed by Waves commissioned in the Medical Service Corps.

SERIOUS CRITICAL PATIENT REPORT
PRNC-NNMC-15

MEMORANDUM FOR MEDICAL OFFICER IN COMMAND — DATE

PATIENT'S NAME		WARD	
RANK OR RATE	SERVICE NUMBER	BRANCH OF SERVICE	RELIGION
DIAGNOSIS		CHANGE SINCE LAST REPORT	

THE ABOVE PATIENT WAS ☐ PLACED ON ☐ SERIOUS LIST ☐ REMOVED FROM ☐ CRITICAL LIST — TIME — DATE

NEXT OF KIN *(Give name in full)*	RELATIONSHIP
NEXT OF KIN ADDRESS	TELEPHONE NUMBER OF NEXT OF KIN
HAS NEXT OF KIN BEEN NOTIFIED? ☐ YES ☐ NO	HAS CHAPLIN BEEN NOTIFIED? ☐ YES ☐ NO

SIGNATURE *(Ward medical officer)*

DISTRIBUTION
ORIGINAL COPY TO MEDICAL OFFICER IN COMMAND
C.C. EXECUTIVE OFFICER — CHIEF NURSE
OFFICER OF THE DAY — SENIOR CHAPLAIN
RECORD OFFICER — INFORMATION DESK

PRNC-10-25-46-25M

Figure 103.—Serious or critical patient report.

It has been customary for the nutrition and *dietetics* billets in the Navy to be filled by members of the Nurse Corps. For several years a special course consisting of 32 semester hours' work and lasting two semesters was given by the home economics department of George Washington University at Washington, D. C. for members of the Navy Nurse Corps. These were fully accredited courses in the university and could be applied toward the degree in Home Economics with a major in nutrition. With the passage of legislation creating a Medical Service Corps as a permanent part of the Navy, the way was opened for the commission of fully trained dietitians, and it is planned that these women will eventually fill the billets in dietetics in naval hospitals.

World War II brought forth another specialty, the trained *flight nurse*. The wartime training program was carried on by the Navy, but with the reorganization of the military services subsequent to the war this training course has become a joint Air Corps-Navy project and is now given at Randolph Field, Texas. These nurses are assigned in wartime to planes evacuating casualties from combat areas. Since the war their duties are concerned with the air transfer of patients.

It is the desire of the Medical Department of the Navy that nurses be assigned to nursing duties, and that physical therapy, occupational therapy, and dietetics assignments be transferred to the Medical Service Corps as soon as qualified personnel is available. The present effort is to prepare nurses for work as specialists in the clinical and administrative fields.

As the courses in related specialties have been discontinued, courses in nursing specialties have been added to the training program. It has now expanded to the point where a nurse who qualifies may be awarded a university-level course in almost any of the nursing areas. These courses, given at major universities, count toward nursing and nursing education degrees. This special preparation is awarded on merit and is available to members of the regular service who can qualify academically and by professional performance record.

NURSE-CHAPLAIN RELATIONSHIP.—The professional relationships between nurses and other members of the health and welfare teams

Local #14
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MARYLAND

RECEIPT NO._____DATE_____

RECEIVED HEALTH RECORD OF

_____FROM
RECORD OFFICE.

SIGNATURE OF MEDICAL OFFICER

_____

Figure 104.—Health record receipt.

—the doctors, laboratory staff, dental staff, social workers, and public health groups—is well known to the average professional nurse, so need not be discussed here. There is, however, another professional group in the Navy more regularly concerned with the welfare of the patient than is commonly found in civil hospitals. This is the Chaplain Corps of the United States Navy. This Corps is an integral part of the Navy, and its members are close associates of the nurse.

We have already indicated in the section concerned with placing patients on the serious or critical list, that they must be seen by the chaplain of their faith. The Navy provides chaplain service for the three predominant faiths found in Naval service; Protestant, Catholic and Hebrew. Naval stations, naval hospitals, and Marine Corps activities have chaplains attached. If a chaplain of each faith is not provided at the hospital or station, the chaplain assigned arranges for the attendance of the local pastor, parish priest, or rabbi, as the case may be, to make rounds in the hospital and provide any indicated spiritual service.

Experienced nurses in the Navy keep the chaplain informed of the conditions of the patients as he makes his rounds. Because of the custom of calling the chaplain as a last resort, the patient who is not constant in the practice of his faith may be concerned for his welfare if the chaplain visits him. This fear can be alleviated by the friendly relationship between the nurse and the chaplain, and the nurse's practice of introducing each patient to the chaplain, whose interest in all activities will result in his acceptance as a member of the

team concerned with the welfare of each patient.

WHERE NURSES SERVE.—Members of the Navy Nurse Corps are assigned to duties in naval hospitals, naval dispensaries, aboard hospital ships, naval transports, air evacuation planes, and at foreign stations. The general fundamentals of nursing in the Navy as outlined in this chapter may be applied to the practice of nursing under any of these conditions. This, plus the specialized training she will receive, will fit her for her job. The nurse assigned to air evacuation is given training for the special aspects of these duties. The nurse reporting to a naval hospital in a hospital ship will be instructed by the chief nurse relative to any special conditions affecting her service aboard.

ADMINISTRATIVE CONTROL OF THE NURSE CORPS

The controlling body of all Medical Department activities is the Bureau of Medicine and Surgery. The Nurse Corps fits within the framework of the personnel section of the Bureau, and the chief administrator of the Nurse Corps is the director. Appointed from among the nurses of the grade of lieutenant commander or commander, the director holds the rank of captain during the period of appointment. She is responsible for the over-all planning and for making recommendations regarding policies concerning the Nurse Corps. In these duties, she is assisted by a staff of Nurse Corps officers who administer the various sections of the Corps..

The appointment section is administered by a Nurse Corps officer who reviews the officially compiled records of all applicants and makes recommendation concerning their appointments. In conjunction with the procurement section of the Bureau of Naval Personnel, she supervises and coordinates the activities of the Nurse Corps officers assigned to the various offices of naval officer procurement.

She coordinates and administers the indoctrination programs carried on at naval hospitals for the orientation of newly commissioned nurses. This is a 6-weeks' program covering various aspects of naval service and is locally conducted under the supervision of a nurse especially trained and detailed by the Bureau of Medicine and Surgery for such duties.

The personnel actions section consists of three units and is administered by two Nurse Corps officers.

1. The detail unit makes recommendations to the Bureau of Naval Personnel regarding the assignments and transfers of Nurse Corps officers. All requests for transfer, special assignment, and similar requests are referred to this officer for action. In order that nurses may be detailed to fullest professional utilization, the nurse in charge of this section maintains the specialty file.

2. The inactivation unit reviews and makes recommendations to the Bureau of Naval Personnel on matters relating to separations from the Nurse Corps. Such separations include resignations, retirements, revocations of appointment, and discharges. She also processes reports of medical survey on Nurse Corps officers. Certificates of satisfactory service, discharge buttons, discharge cards, and reserve identification cards are prepared in this section. Requests for change of name due to marriage or divorce are referred to this unit for action.

3. The promotion unit maintains the lineal list of Nurse Corps officers and makes recommendations to the Bureau of Naval Personnel in regard to the promotions of Nurse Corps officers, in accordance with established promotion laws and policies.

The information and postgraduate education section is administered by a Nurse Corps officer who is designated as the educational director, or educational officer. She collaborates with the public relations offices of the Bureau of Medicine and Surgery and the Navy Department in making available to the public, information regarding the Nurse Corps. In matters relating to nurse procurement, there is collaboration of the nurse in this section and the nurse who administers the appointment section.

In matters relating to education, this Nurse Corps officer plans and develops the educational program and makes recommendations regarding all matters concerned with nursing education and professional standards. She maintains liaison with colleges, universities, and special

schools, arranging courses in the specialties to meet the needs of the Navy and of the individual nurses.

All applications for special training for nurses are referred here for processing and recommendation. In processing, the complete professional record of the nurse, including all academic transcripts and fitness reports, is reviewed. The completed review is presented to the Advisory Board for decision, and correspondence relating to the decision of the Advisory Board is transmitted to the nurse via official channels.

The budget and statistics section is administered by an officer of the Nurse Corps who prepares the budget for both the regular Navy and members of the Naval Reserve Nurse Corps on active duty.

This budget is submitted to the finance division of the Bureau of Naval Personnel for correlation with the over-all personnel. In addition, the officer administering this section prepares statistical reports and data as may be required, maintaining a file showing the census, distribution, and status of all Nurse Corps officers on active duty.

Though the Naval Reserve Nurse Corps Section is a part of the Reserve Division, a Nurse Corps officer is assigned to handle its administrative duties. She serves as liaison between the Navy Nurse Corps and the Reserve Division of the Bureau of Medicine and Surgery.